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JUNE 12, 1939
VOLUME 28, No. 12

AMERICAN DYESTUFF REPORTER

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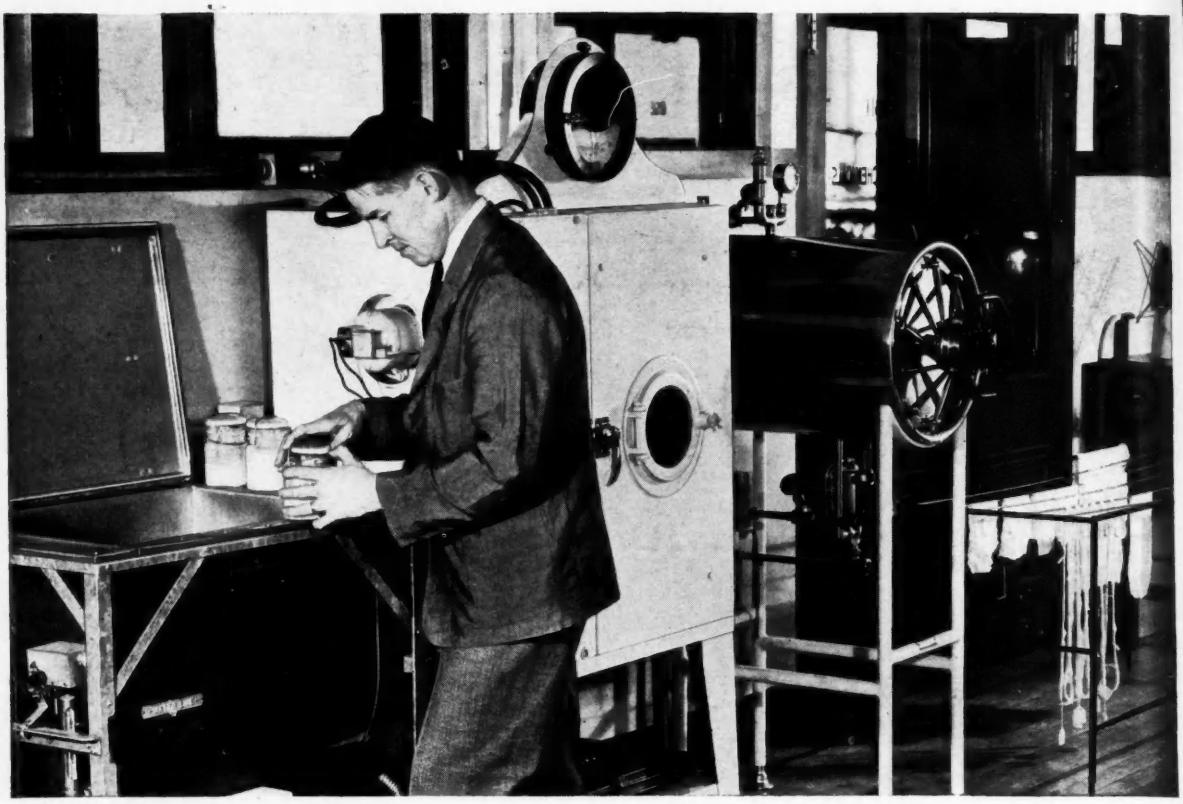

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JUNE 12, 1939

VOLUME 28 NUMBER 12

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Contents

Contents of previous issues can be found by consulting the Industrial Arts Index at your library

• Special Articles

Physical and Chemical Textile Testing—XIV..... 307
John H. Skinkle

• Departments

Trade Notes—New Products..... 325

• Editorial

Cotton, Scientists and Fatalists..... 323

• Proceedings of the American Association of Textile Chemists and Colorists

Group C—Fastness Tests for Dyed or Printed Cotton... P312

Calendar of Coming Events..... P314

Recent Organic Chemical Developments..... P315
M. A. Dahlen

Meeting, Southeastern Section..... P319

The Economic Situation P320
W. M. McLaurine

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AMERICAN
DYESTUFF REPORTER

VOLUME 28 JUNE 12, 1939 NUMBER 12

Physical and Chemical Textile Testing—XIV

JOHN H. SKINKLE*

PART II—CHEMICAL TESTING

(Continued from March 6, 1939 issue)

Chapter 13—Swelling and Damage in Cellulose Fibers (Continued)

BARIUM ACTIVITY NUMBER

THE increased absorption of swollen cellulose for various substances is most conveniently and accurately measured in the case of barium hydroxide. The original method of Neale has been greatly simplified by Edelstein who also found that the results are unaffected by the presence of dye.

Solutions used:

Barium hydroxide solution approximately .25N—may vary between .16N and .30N.

Standardized N/10 hydrochloric acid.

The sample should be freed from oils, fats, waxes, etc. by extraction and finishing materials should be removed by scouring. A sample of unmercerized American cotton should be run at the same time. The samples are weighed out at room conditions and no regain correction is necessary. Exactly 2.00 gram samples are weighed out (on a centigram balance) and placed in small conical flasks. Using a 10cc. pipet, 30cc. of barium hydroxide solution is pipetted into each flask, the flasks are stoppered and allowed to stand at room temperature with frequent shaking for at least 2 hours. After 2 hours, 10cc. of barium hydroxide is withdrawn from each flask and titrated with the standard hydrochloric acid using phenolphthalein indicator. A blank titration is also run on 10cc. of unused barium hydroxide. The same pipet and buret should be used throughout the test. The barium activity number is defined as:

$$\frac{\text{Barium hydroxide absorbed by mercerized sample}}{\text{Barium hydroxide absorbed by unmercerized sample}} \times 100$$

and since the normality of the barium hydroxide is the same and the weight of sample is the same,

$$\text{Barium activity number} = \frac{a-b \times 100}{a-c}$$

where a = cubic centimeters of acid for blank
b = cubic centimeters of acid for mercerized sample
c = cubic centimeters of acid for unmercerized sample

Unmercerized American cotton, of course, is 100 on this scale and a remarkable uniformity is obtained on all samples tested, so that any American cotton may be used as the standard. A large number of commercially mercerized cotton cloths gave values of 116-130 while a number of commercially mercerized cotton yarns gave values of 150-160. If the above mercerized cloths are remercerized in the laboratory, their barium activity numbers may be raised to 150-160 also.

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(1) Yearbook of the A.A.T.C.C.—Volume VI. Howes Publishing Co., Inc., New York, 1938.

(2) Neale, S. M. Preferential Absorption of Barium Hydroxide as a Characteristic Property of Cellulose and an Indication of Previous Mercerization or Other Swelling Treatment. Journal of the Textile Institute *22*, T349 (1931).

(3) Edelstein, S. M. Test for Mercerization in the Presence of Dyes. American Dyestuff Reporter *25*, 186 (1936).

ASH ALKALINITY

The method of determining ash alkalinity has already been given (Chapter 10). To use it as a measure of degradation, the sample should first be given a standard acid wash which removes the alkaline ash from cellulose but leaves it combined with the carboxyl group in the case of oxycellulose.

The standard acid wash consists of steeping the sample for one hour in N/10 sulfuric acid, washing twelve times in distilled water and centrifuging after each wash, steeping in water for three hours, rewashing, and air drying.

A close correlation has been found between ash alkalinity after the standard acid wash and Methylene Blue Absorption.

REFERENCES

(1) Dorée, C. Methods of Cellulose Chemistry. D. Van Nostrand Co., Inc., New York, 1933.

SOLUBILITY IN SODIUM HYDROXIDE

In the absence of any finishing compounds, this test is a very useful one since it is simple to carry out and applicable to any type of damage. Two methods have been suggested—the 10N-2N method which is rather complex and the N/4 method which is the simplest and most used method and which will be given here. The original method called for a 4 hour boil but this is almost universally reduced to one hour.

A 2 gram sample is dried and weighed and is then boiled for one hour in 200cc. of N/4 sodium hydroxide (1 per cent solution), using a reflux. The liquor is de-

*Lowell Textile Institute.

canted into a Gooch crucible, the residue is washed with sodium hydroxide solution, then with water, and finally with N/10 sulfuric acid. The residue is collected in the crucible and washed with water until the washings are neutral to litmus; the crucible and contents are dried for 3 hours at 110° C. and weighed.

Using this method, the loss in weight of a normal cellulose is 1.5 per cent and anything over this value is indicative of damage. It has also been shown that, for any kind of damage, the loss in sodium hydroxide = 6 x copper number up to a copper number of 2.5; beyond this point hydrocelluloses lose more and oxycelluloses lose less than 6 x copper number.

REFERENCES

(1) Dorée, C. Methods of Cellulose Chemistry. D. Van Nostrand Co., Inc., New York, 1933.

METHYLENE BLUE ABSORPTION

The absorption of Methylene Blue by cellulose derivatives is generally due to the carboxyl groups present in oxycelluloses formed by alkaline oxidation but it may also be due to mineral acids which have been dried into the cellulose and are not easily washed out (hydrocelluloses of the acid dried-in type). A distinction may be made between these two however by previously boiling in dilute sodium hydroxide which does not materially change the Methylene Blue absorption of the oxycellulose but decreases it in the case of the hydrocellulose.

The method depends upon treating the sample with a Methylene Blue solution of known strength and buffered to a known pH (usually pH = 7) and determining the concentration of the Methylene Blue in the solution either by titration with Naphthol Yellow S or by the colorimetric method. A buffered solution is necessary because the Methylene Blue is very sensitive to traces of acid and alkali, even the alkali from the laboratory glassware affects the results if unbuffered.

Purification of Methylene Blue: the ordinary Methylene Blue Hydrochloride (molecular weight = 320) is recrystallized three times from twelve times its weight of water, the moisture is then determined on a small portion of the powder and the remainder is used to make up the solution. In accurate work, the purity of the Methylene Blue Hydrochloride may be determined by titanous chloride.

Preparation of solutions: an M/250 solution of Methylene Blue at pH 7 is prepared by mixing 6.81 grams of potassium dihydrogen phosphate, 29.63cc. of 1-normal sodium hydroxide, and 1.279 grams of pure Methylene Blue Hydrochloride and making up to one liter with water. An M/250 solution of Methylene Blue at pH 2.7 may be prepared by taking 1.279 grams of pure Methylene Blue Hydrochloride and making up to one liter with N/5 acetic acid.

Naphthol Yellow S solution: prepare a solution containing 1.5 to 2.0 millimoles per liter and standardize against the Methylene Blue. The addition of the Naphthol Yellow S to the Methylene Blue solution produces a brown precipitate and the solution becomes less and less blue and finally changes to yellow. The end-point may best be detected by observing a drop suspended on a glass rod, or by spotting on filter paper, or better by centrifuging.

Procedure by titration method: a sample of 2.5 grams weight is placed in a test tube or small conical flask and 15cc. of Methylene Blue is added from a buret; the sample is well worked in the solution and is left for 18 hours at room temperature. With a pipet, 10cc. of solution is withdrawn and titrated with the Naphthol Yellow S. The Methylene Blue absorbed by the sample is calculated in millimoles per 100 grams of dry sample (moisture determined on a separate sample).

Procedure by colorimetric method: this procedure uses M/2500 Methylene Blue solution obtained by diluting the M/250 solution to one-tenth of its original strength. From 1.5 to 2.0 grams of sample in small pieces are shaken with 50cc. of Methylene Blue solution at room temperature for 18 hours. Some of the solution is then removed and compared in a colorimeter with Methylene Blue solution of M/5000 concentration. The results are calculated as in the titration method.

If the values at pH 7 and pH 2.7 are to be determined, the test may be carried out at pH 7, the sample may then be washed with water, then treated at the boil with N/5 acetic acid until only a slight blue color is left. It is then washed and used for a test at pH 2.7.

Uses of the Methylene Blue Absorption include the following:

1. To distinguish various cottons—at pH 7 American cottons have values of .8 to .9, Egyptian cottons 1.0 to 1.1, and Sea Island cottons about 1.0.

2. To distinguish between oxycelluloses due to acid oxidation (low Methylene Blue Absorption) and alkaline oxidation (high Methylene Blue Absorption). See Table XVII.

3. To distinguish the acid dried-in type of hydrocellulose. In the case of cellulose or oxycellulose, the absorption at pH 7 is greater than at pH 2.7, whereas in the case of hydrocellulose of the acid dried-in type the absorption at pH 7 is less than at pH 2.7. This identification may also be made by a previous treatment with dilute sodium hydroxide, as mentioned earlier in this section.

The disadvantages of the Methylene Blue Absorption are:

1. The colorimetric method requires a colorimeter, the titration method requires a centrifuge for a clear end point; these pieces of apparatus are expensive and not always available.

2. The test requires over 18 hours to carry out.

3. The results are of value chiefly for differentiation—other tests give as good a measure of damage and require less time and equipment.

REFERENCES

(1) Dorée, C. Methods of Cellulose Chemistry. D. Van Nostrand Co., Inc., New York, 1933.

(2) Clibben, D. A. and Geake, A. Absorption of Methylene Blue from Buffered Solutions. Journal of the Textile Institute *17*, T127 (1926).

COPPER NUMBER

Copper number may be defined as the number of grams of copper reduced from the cupric to the cuprous state in alkaline solution by one hundred grams of dry sample. The reduction, in the absence of any sugars or other extraneous material, is due to the aldehyde groups present and consequently approaches zero for pure cellulose but is quite high for hydrocellulose and oxycellulose. The copper number was originally carried out as a quantitative evaluation of the Fehling's Solution test which has been described as a qualitative test for damage to cellulose, but it was found that the strong alkali used in Fehling's Solution in the presence of the oxygen of the air caused a progressive oxycellulose formation; for this reason a modified solution is employed in the now universally accepted Schwalbe-Braidy method which will be given in detail.

Solutions used:

Solution A: 100 grams of crystalline copper sulfate per liter.

Solution B. 50 grams of sodium bicarbonate and 350 grams of sodium carbonate ($Na_2CO_3 . 10H_2O$) per liter.

Ferric alum: 100 grams of ferric alum and 140 cc. of concentrated sulfuric acid per liter.

Dilute sodium carbonate: 5 grams of sodium carbonate (Na_2CO_3) per liter.

Dilute sulfuric acid: approximately 2N.

Standard permanganate: N/25 potassium permanganate (standardized).

Procedure: Determine regain on a separate sample. Over a 2.5 gram sample in a 100 cc. conical flask is poured a boiling mixture of 5 cc. of Solution A and 95 cc. of Solution B. The mouth of the flask is covered and the flask is placed in (not on top of) a rapidly boiling water bath or in a steam bath for exactly 3 hours. The contents are then filtered by suction through a fritted glass filter (or Gooch crucible with asbestos mat) and the residue is washed first with dilute sodium carbonate and then with water; the filtrate and washings are discarded. Over the residue on the filter is poured 50 cc. of ferric alum solution divided into four lots, and the residue is then washed with dilute sulfuric acid. The combined ferric alum and acid washings are titrated with the standard permanganate; a blank is also run on 50 cc. of unused ferric alum. A sample determination follows:

a.	Weight of bottle and sample	41.3650 gms.	
b.	Weight of bottle and dry sample	41.2735	
c.	Weight of bottle alone	37.7655	
d.	Weight of moisture (a-b)	.0915	
e.	Weight of dry sample (b-c)	3.5080	
f.	% regain (100d/e)	2.60%	
g.	Weight of sample	2.52 gm.	2.49 gm.
h.	Dry wt. of sample $\left(\frac{g}{1+ f/100}\right)$	2.46	2.43
i.	Volume of $KMnO_4$ used	9.55 cc.	9.30 cc.
j.	Volume of $KMnO_4$ for blank	.15	.15
k.	True volume of $KMnO_4$ (i-j)	9.40	9.15
m.	Normality of $KMnO_4$	.0395N	.0395N
n.	Milliequivalent weight of copper	.0636	.0636
o.	Copper number ($100 \times k \times m \times n/h$)	0.96	0.94
p.	Copper number (average)	0.95	

A blank of .01 may be obtained by running a test with no cellulose present and theoretically this should be subtracted from any value found, but actually it is generally neglected. The method is fairly critical so that the time, temperature, and weight of sample must be as specified. The amount of copper present in the solution is enough to give a copper number of 5.2 as a maximum, so that if a first determination shows a copper number of 4 or over, the determination should be repeated, using a 1.0 gram sample instead of a 2.5 gram sample; in which case copper numbers up to 10 may be determined.

A micro-method for use on very small samples is also available: a 0.25 gram sample is taken in a 4x¾ inch test tube (covered). To 9.5 cc. of B is added 0.5 cc. of A; the mixture is heated to boiling and poured over the sample; the test tube is immersed in boiling water for three hours, stirring after 10 minutes to remove carbon dioxide. The mixture is filtered on a fritted glass filter (or Gooch crucible and asbestos mat) and washed with distilled water three times. Then 5 cc. of ferric alum is added to the reaction tube and poured over the sample on the filter in several lots; the residue is washed with several lots of distilled water of 2 cc. each. The ferric alum and washings are then titrated with standard permanganate, using a microburet reading to .005 cc. A blank is run on 5 cc. of ferric alum solution.

Bleached cotton will range from .01 to 0.3; cottons which have had a thorough scouring and a mild bleach having the lower range of values (.01 to 0.1) and cottons which have had a less thorough scouring and a more vigorous bleach having the upper range (0.1 to 0.3); the maximum value compatible with good bleaching is 0.3 and preferably a good bleached cotton should be below 0.1. Oxycelluloses formed by oxidation to the point of disintegration of the fiber will range from 6 to 40 and hydrocellulose formed by hydrolysis to disintegration will range from 3.5 to 9.0. The values to be expected for normal rayons and cotton damaged to various extents are given in Table XVIII.

The copper number and the solubility in dilute sodium hydroxide are related, as we have already seen in the discussion of the solubility test.

Copper number is, in general, a useful test for damage; it has only two disadvantages:

1. It is not sensitive to incipient damage; as shown in Table XVIII, up to 10 per cent damage may exist with very little change in copper number.

2. A sample which has been given an alkaline boil-off (scouring or laundering) after being damaged but before

testing for copper number will not show damage by the copper number test unless the damage is very great.

REFERENCES

(1) Dorée, C. Methods of Cellulose Chemistry. D. Van Nostrand Co., Inc., New York, 1933.

(2) Clibbens, D. A. and Geage, A. Determination of Copper Number. Journal of the Textile Institute *15*, T27 (1924).

FLUIDITY

Viscosity is the internal friction of a liquid on itself, or its resistance to flow; its units are dynes per square centimeter per centimeter per second or poises. Fluidity is the ease of flow and is the reciprocal of viscosity; its units are reciprocal poises:

$$F = 1/V$$

where V = viscosity in poises

and F = fluidity in reciprocal poises.

There are three general methods of measuring viscosity or fluidity:

1. Resistance to flow through a capillary tube.
2. Resistance to fall of a ball through the fluid.
3. Resistance to rotation of a disc or cylinder in the fluid.

An instrument which measures the viscosity is known as a viscometer, so that we have three general types of viscometers based on the three methods above, but the capillary flow type of viscometer is best adapted to liquids of low viscosity (high fluidity) and is the only one which we will consider at this time. In the determination of the fluidity of cellulose and its derivatives, the Clibbens and Geake method and viscometer is the one most used and which we will consider.

It has been shown that cuprammonium hydroxide solution (to be referred to hereafter as "cuprammonia") will react with and dissolve cellulose and its derivatives without breaking the molecular chain except in the case of one oxycellulose, as mentioned in the introduction of this chapter; cuprammonia therefore is used as the solvent for the cellulose. Since the solution of the cellulose presents some difficulties, a standard composition and method of preparation of the solvent has been worked out; the solvent should contain:

15 ± 0.1 gram of copper per liter

200 ± 5 grams of ammonia per liter

and should have the following physical properties at 20° C.:

d = 0.94 where d = density in grams per cubic centimeter

F = 72 where F = fluidity in reciprocal poises.

To prepare this solvent, the following procedure should be used: Mix 2.6 liters of concentrated ammonia (density = 0.88), 0.4 liters of water, and 3 grams of cane sugar. Stir the solution mechanically at 400 r.p.m. with 180 grams of precipitated copper which has passed a 60-mesh sieve. Blow through air at the rate of 10 liters per hour which has previously been bubbled through strong ammonia. This reaction is allowed to proceed for 5 hours, after which the solution is analyzed for copper and ammonia content and adjusted to the standard concentrations. The final solvent should be stored in an inert atmosphere or kept in full containers which are just large enough to hold one viscometer charge or a little over. Copper is determined colorimetrically by comparison with solutions of known copper content and the ammonia is determined by titrating a portion of the solvent with standard acid and subtracting the amount of acid corresponding to the already determined copper content.

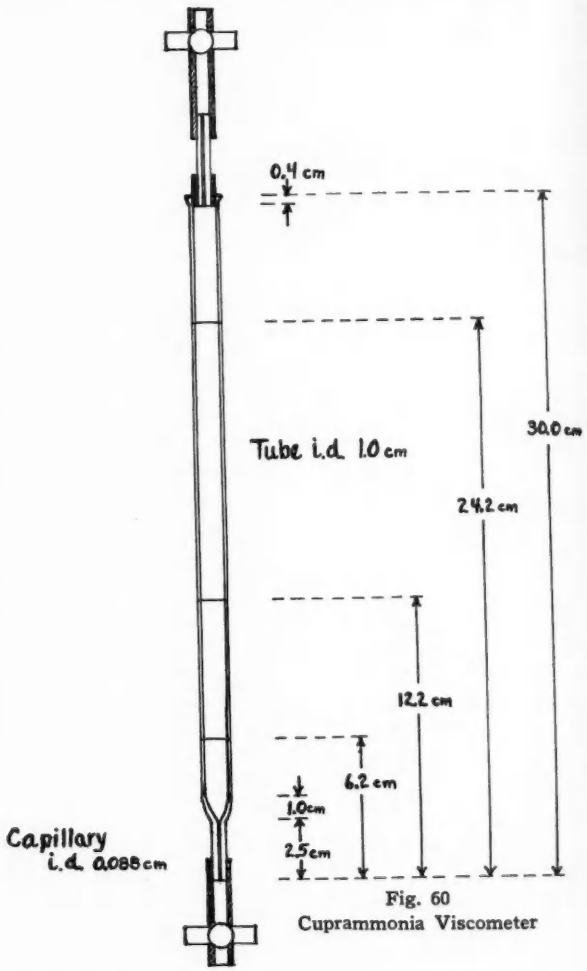

Fig. 60
Cuprammonia Viscometer

The Clibbens and Geake viscometer is shown in Figure 60 and should be made as closely as possible to the dimensions given; in this country the viscometer and its support may be obtained from laboratory supply houses under the name of "pulp viscometer." The time at 20° C. is measured for the level of liquid to fall from the top ring to the bottom ring. The middle ring may be used to check on the results since for a truly viscous liquid the time for the level to fall from the top ring to the middle ring should equal the time from the middle to the bottom ring. The viscometer should be fitted at the bottom with a short piece of rubber tubing and a clamp and at the top with a stopper and capillary tube with rubber tubing and clamp attached.

(Continued on page 324)

PROCEEDINGS OF THE

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JUNE 12, 1939

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ANNUAL MEETING and CONVENTION

The date of the Annual Meeting has been chosen to coincide with the closing date of the Annual Meeting of the American Chemical Society which starts in Boston on Sept. 11, 1939. This will give persons who are members of both organizations an opportunity to attend both meetings.

Members from the South and West, coming through New York, may stop off to attend the World's Fair.

• Headquarters—Copley-Plaza Hotel •

BOSTON, MASS., SEPT. 15 and 16, 1939

Group C-Fastness Tests for Dyed or Printed Cotton

I. Fastness to Laundering or Domestic Washing of Dyed or Printed Cotton (with Launder-Ometer)

The A.A.T.C.C. Committee on "Fastness to Washing of Dyed Cotton Material" has, during the past year, been making a re-study of the official methods for Fastness to Washing of Dyed Cotton Material which were accepted by the Association several years ago. As a result of cooperation with different interests a number of changes have been made and it is believed that as now published it is generally acceptable to practically all interested organizations.

It is specially requested that any members of the Association or other readers of the Dyestuff Reporter who are interested in this subject will look over this newly published method and series of standards and send any suggestions or criticisms which they may have to Mr. George A. Moran, Calco Chemical Company, Bound Brook, N. J., who is Chairman of the Committee.

L. A. OLNEY,
Chairman, Research Committee.

OFFICIAL METHODS

Sample of Material. If piece goods, a piece 2 inches by 4 inches, sewed onto a piece of unsized bleached cotton cloth of similar size is a convenient sample to work with. If yarn, it may be knit so as to give a sample of similar size to above and sewed to a piece of unsized bleached cotton or the yarn may be made into a braid with undyed cotton yarn for testing.

Neutral Soap Solution. For tests No. 1 and No. 2—5 grams of soap per liter of water.

Alkaline Soap Solution. For tests No. 3 and No. 4—5 grams of soap, 2 grams of sodium carbonate per liter of water.

Soap. The soap used should be a good grade of neutral chip soda soap, free of rosin and all substances other than true soap. A low titre soap is to be preferred. A green olive oil soap or such products as Ivory Flakes or Lux or a chip tallow soap answers the requirements. The soap solutions are made up on the basis of 88 per cent soap.

Water. Ordinary tap water may be used if not over 2 degrees of hardness, otherwise distilled water should be used.

Hypochlorite of Soda Solution. The commercial product testing 10 per cent to 15 per cent available chlorine as sold for laundry use is a convenient product for this test. Its strength must be determined by chemical analysis at frequent intervals as it loses strength on standing.

Machine. The tests are carried out in the Launder-Ometer. (See page 138, 1938 Year Book.)

TEST METHODS

Test Method Number 1. Enter sample to be tested into glass jar containing 100 cc. of .5 per cent neutral soap solution heated to 105° F., add ten ⅜" approved rubber or twenty ¼" stainless steel balls, then close jar tightly and place in Launder-Ometer which is already half filled with water at 105° F. Rotate in machine for 30 minutes, maintaining the temperature at 105° F. ± 2° F. Empty jar and rinse twice with 100 cc. water at 105° F. by shaking vigorously for 1 minute. Rinse again with 100 cc. of a .05 per cent acetic acid solution at 80° F. Give a final rinse with water at 80° F. Hydro extract or wring and dry by pressing the sample in contact with the white cloth with a moderately hot flatiron.

Test Method Number 2. Enter sample to be tested into glass jar containing 100 cc. of a .5 per cent neutral soap solution heated to 120° F., add ten ⅜" approved rubber or twenty ¼" stainless steel balls, then close jar tightly and place in Launder-Ometer which is already half filled with water at 120° F. Rotate in machine for 30 minutes, maintaining the temperature at 120° F. ± 2° F. Empty jar and rinse twice with 100 cc. water at 105° F. by shaking vigorously for 1 minute. Rinse again with 100 cc. of a .05 per cent acetic acid solution at 80° F. Give a final rinse with water at 80° F. Hydro extract or wring and dry by pressing the sample in contact with the white cloth with a moderately hot flatiron.

Test Method Number 3. Enter sample to be tested into glass jar containing 100 cc. of a .5 per cent soap and .2 per cent sodium carbonate solution heated to 160° F., add ten ⅜" rubber or twenty ¼" stainless steel balls, then close jar tightly and place in Launder-Ometer which is already half filled with water at 160° F. Rotate in machine for 45 minutes, maintaining temperature of 160° F. ± 2° F. Empty jar and rinse twice with 100 cc. water at 105° F. by shaking vigorously for 1 minute. Rinse again with 100 cc. of a .05 per cent acetic acid solution at 80° F. Give a final rinse with water at 80° F. Hydro extract or wring and dry by pressing the sample in contact with the white cloth with a moderately hot flatiron.

Test Method Number 4. Enter sample to be tested into glass jar containing 100 cc. of .5 per cent soap and .2 per cent sodium carbonate solution heated to 185° F. An addition of 1 cc. of a 1 per cent available chlorine solution of

sodium hypochlorite is made just before entering the test sample. Add ten ⅜" rubber or twenty ¼" stainless steel balls, then close jars tightly and place in Launder-Ometer which is already half filled with water at 180°-185° F. Rotate in machine for 45 minutes, maintaining temperature as above. Empty the jar and rinse twice with 100 cc. of water at 105° F. by shaking vigorously for 1 minute. Rinse again with 100 cc. of a .05 per cent acetic acid solution at 80° F. Give a final rinse with water at 80° F. Hydro extract or wring and dry by pressing the sample in contact with the white cloth with a moderately hot flatiron.

TABULATION OF TESTING METHODS

Test Method Number	*Temperature*	*Soap*	*Soda Carbonate*	*Available Chlorine*	*Time*
1.....	105° F.	.5%	none	none	½ hr.
2.....	120° F.	.5%	none	none	½ hr.
3.....	160° F.	.5%	.2%	none	¾ hr.
4.....	180-185° F.	.5%	.2%	.01%	¾ hr.

For test methods Number 3 and 4, it is advisable to preheat the glass jars and contents in a water bath before putting in Launder-Ometer, to avoid breakage and to insure correct working temperature.

WASH FASTNESS CLASSIFICATION

The following 5 classes of fastness to washing are distinguished by the four above test methods. Dyeings should be assigned to the highest class for which they qualify.

Class O. Cotton textiles which show an appreciable change in color or staining of white fabrics when subjected to Test No. 1 have Class O fastness. They possess poor or no fastness to washing.

Class I. Cotton textiles which show no appreciable change in color and no appreciable staining of white fabrics when subjected to Test No. 1 have Class I fastness. They may be expected to stand only a very careful washing at low temperature and can not be considered suitable for ordinary commercial laundry washing.

Class II. Cotton textiles which show no appreciable change in color and no appreciable staining of white fabrics when subjected to Test No. 2 have Class II fastness to washing. They will stand home washing or commercial laundry washing if the washing treatment is carried out at a temperature below 120° F. with neutral soap only.

Class III. Cotton textiles which show no appreciable change in color and no appreciable staining of white fabrics when subjected to Test No. 3 have Class III fastness. They will stand repeated washing treatments at high temperatures either home washing or commercial laundry washing when chlorine is not used in washing treatment.

Class IV. Cotton textiles which show no appreciable change in color and no apreciable staining of white fabrics when subjected to Test No. 4 have Class IV fastness. They will stand repeated washing treatments at high temperatures either home washing or commercial laundry washing. This class meets the highest requirements of either home or commercial laundry washing.

By appreciable change is understood a change that, under good light conditions, is immediately noticeable, on comparing the washed sample with the original dyeing or a staining of the white cotton that is immediately noticeable on inspection; when a careful inspection or change in angle of light is required to make apparent the change, it is not considered appreciable for the purpose of this test.

STANDARDS FOR COMPARISON

For convenience in grading the tests, a standard dyed sample for comparison has been established for each class of fastness. It is a guide as to what constitutes a satisfactory degree of fastness to pass a given test.

The washing test should be carried out comparatively against the corresponding standard dyed sample which has been prepared for the purpose. The results of the test are determined by comparison with the change of shade and staining of white fabric produced by the same test on the corresponding standard dyed sample.

Standard Dyed Samples. The standard dyed samples dyed on full bleached cotton print cloth 64 x 60 are as follows:

C.W. 1—For Class I—A 2 per cent dyeing of Direct Fast Blue SFF Pr. 54—1938 year book.

C.W. 2—For Class II—A 4 per cent dyeing of Primuline Conc. C.I. 812. Diazotized and developed with Beta Naphthol.

C.W. 3—For Class III—A 2 per cent dyeing of Vat Blue 2BD 100 per cent powd. C.I. 1184.

C.W. 4—For Class IV—A 3 1/3 per cent dyeing of Vat Violet BN 100 per cent powd. C.I. 1163.

These standard dyed samples dyed with the above specified dyestuffs and according to standard dyeing procedures as specified below, are available for distribution. For further information see footnote on page 137—1938 year book of A.A.T.C.C.

Dyeing Methods for Standard-Dyed Samples. All dyeings are made on full bleached 64 x 60 cotton print cloth.

C.W. 1—2 per cent dyeing of Direct Fast Blue SFF Pr. 54—1938 year book.

Dyestuff—2 per cent of weight of cotton
Glauber's Salt—40 per cent of weight of cotton
Water—20 times weight of cotton
Soda Ash—½ per cent weight of cotton

Enter cotton in dyebath containing dyestuffs in solution at boil, work for 20 minutes and add ½ Glauber's salt, work 20 minutes more and add balance of Glauber's salt, work for 20 minutes, rinse, lift, and dry.

C.W. 2—4 per cent dyeing of Primuline Conc. (C.I. 812) Diazotized and developed with Beta Naphthol.

Dyestuff—4 per cent of the weight of the cotton
Glauber's Salt—40 per cent of the weight of the cotton
Soda Ash—½ per cent of the weight of the cotton
Dyebath—20 times the weight of the cotton
Nitrite of Soda—2 per cent the weight of the cotton
Hydrochloric Acid—20° Be—8 per cent of the

weight of the cotton
Beta Naphthol—2 per cent of the weight of the cotton
Caustic Soda—¾ per cent of the weight of the cotton

Enter cotton in dyebath containing the dyestuff in solution at boil, work for 20 minutes and add ½ Glauber's salt, work for 20 minutes and add balance of Glauber's salt, work for 20 minutes, lift, rinse and enter into cold bath containing the sodium nitrite and hydrochloric acid, lift, rinse well, and enter into cold bath containing the beta naphthol and caustic soda in solution. Lift and rinse. Soap at 160° F. for 5 minutes in .1 per cent soap solution, rinse and dry.

C.W. 3—2 per cent dyeing of Vat Blue 2BD—100 per cent powd. (C.I. 1184).
Dyestuff—2 per cent of weight of the cotton
Sulfonated Castor Oil 50 per cent—½ per cent of the weight of the cotton
Caustic Soda—5 per cent of the weight of the cotton
Hydrosulfite of Soda Conc. Powder (90 per cent)—8 per cent of weight of cotton
Dyebath—20 times the weight of the cotton

The dyestuff is weighed out, a 5 per cent solution of caustic soda added and a ½ per cent solution of Sulfonated Castor Oil, then the hydrosulfite of soda concentrated powder is sprinkled in and the solution brought to 140° F. and reduction is continued at 160° F. for 20 minutes or till the dyestuff is completely reduced. The dyebath is then made up to volume at 140° F. and the cotton is entered and worked at that temperature for 40 minutes. It is then lifted, squeezed, and oxidized in air for 5 minutes. It is then oxidized for ½ minute in a solution containing .5 per cent sodium bichromate and .5 per cent acetic acid at 120° F., then well rinsed in cold water, soaped for 5 minutes at the boil in a .1 per cent soap and .05 per cent sodium carbonate solution, then rinsed and dried.

C.W. 4—A 3 1/3 per cent dyeing of Vat Violet BN 100 per cent powd. (C.I. 1163).
Dyestuff—3 1/3 per cent of the weight of cotton
Caustic Soda—5 per cent of the weight of cotton
Hydrosulfite of Soda Conc. Powder (90 per cent)—8 per cent of weight of cotton.
Dyebath—20 times the weight of the cotton

The dyestuff is weighed out, a 5 per cent solution of caustic soda added, then an equal volume of water. The hydrosulfite is then sprinkled in and the temperature brought to 140° F. and the reduction continued for 20 minutes or until completely reduced. The dyebath is then made up to volume, the cotton entered, and the dyeing continued for 40 minutes at 120° F.; the cloth is then lifted, squeezed, and allowed to oxidize in air for 5 minutes. It is then worked for ½ minute in a bath containing .5 per cent sodium bichromate, .5 per cent acetic acid at 120° F., rinsed well in running cold water, and soaped at boil for 5 minutes in .1 per cent soap, .05 per cent sodium carbonate solution. It is then rinsed and dried.

Standard C.W. 4 represents the highest degree of fastness and does not lose in shade or stain white cotton if repeatedly subjected to normal laundry treatment.

Standard C.W. 3 represents a slightly lower degree of fastness than C.W. 4, mainly as regards fastness to chlorine.

Standard C.W. 2 represents a materially lower degree of fastness than C.W. 4 or C.W. 3. It is less fast to chlorine and distinctly less fast to washing at high temperatures. It does not lose much in shade, but is liable to stain white fabrics slightly if the washing temperature goes above 125° F.

Standard C.W. 1 represents a grade of dyeings that must be washed carefully and at quite low temperatures. This grade is unsuitable for use as trimmings and should not be washed with other garments liable to be injured by a slight amount of staining. Washing temperatures should be below 100° F. and there is likely to be a slight loss of shade with each successive washing.

Group C—1—Alternate Method. Without Launder-Ometer. As no method has been found that gives results exactly comparable with those obtained by using the official methods carried out in the Launder-Ometer, the alternate methods, formerly in effect, have been discontinued. It must be understood that tests carried out in beakers are not to be relied upon as giving results identical with those produced in the Launder-Ometer.

CALENDAR OF COMING EVENTS

Council meeting, New York City, 9:30 A.M., June 16, 1939.

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Outing, New York Section, North Jersey Country Club, Paterson, New Jersey, June 16, 1939.

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Outing, Mid-West Section, Lake Lawn Hotel on Delavan Lake, Delavan, Wis., June 17, 1939.

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Outing, Piedmont Section, Ocean Forest Hotel. Myrtle Beach, S. C., June 23 and 24, 1939.

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Annual Outing, South Central Section, Lookout Mountain Hotel, Lookout Mountain, Tenn., August 4 and 5, 1939.

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Annual Meeting, Boston, Mass., September 15 and 16, 1939. Headquarters: Copley-Plaza Hotel.

Recent Organic Chemical Developments*

M. A. DAHLEN**

THE industrial age in which we live is about a century old. In reviewing the developments of these hundred years, it becomes apparent that although progress has been made almost continuously in all lines, various periods were characterized by unusual developments in specific fields. For example, the middle years of the 19th century saw the amazing growth of the railroads, providing for the first time rapid transportation of men and goods over long distances. This period was followed by the electrical era, contributing rapid communication by telegraph and telephone, electrical illumination, long-distance transmission of electrical energy, and the almost universal adoption of the electric motor for the operation of machinery. The first part of the present century brought the automobile, providing rapid individualized transportation and more flexible movement of goods. The "twenties" will be remembered chiefly for the radio (and perhaps stock market activity).

In each of the above developments, the basic discoveries preceded intensive commercial growth by many years. Watts' steam engine, Faraday's electrical experiments and de Forest's vacuum tube all were decades old when the corresponding steam railroad, electrical industry and radio become part of our daily life. Although organic chemistry supposedly began with Wöhler's synthesis of urea in 1828, and the Wright brothers' airplane demonstrations occurred near the turn of this century, history probably will recognize the "depression and repression thirties" as the eras of industrial organic chemistry and aviation.

In the time at my disposal, I shall attempt to give you a few random pictures of the happenings in industrial organic chemistry, and the effect of recent developments on the lives of all of us. I do not expect to burden you with the carbon chains, hexagons and other devices of the organic chemist, which serve chiefly to confuse the uninitiated. Rather, I hope to present to you in everyday language a few of the chemists' new products and processes, to point out some of their merits, and to indicate the broad economic effects of certain of these developments.

PETROLEUM INDUSTRY DEVELOPMENTS

Probably no organic chemical product is as important to our present day life as gasoline. The past ten years have witnessed notable chemical developments in motor fuels. The very high power produced by the modern motor-car in relation to fuel consumption is due largely to the production of gasolines of high anti-knock value. At first, this anti-knock value was obtained by blending the old straight run and cracked gasolines to give proper distillation characteristics, then adding lead tetraethyl to produce anti-knock values in the neighborhood of 70 octane. Now motor-cars are designed with compression ratios requiring around 80 octane for top performance, and the best aviation engines require over 100 octane. The old refining and "leading" methods alone cannot meet these requirements economically.

The petroleum chemists have learned to convert the low boiling and gaseous products of the refinery, particularly butanes and butylenes, by catalytic processes to higher boiling gasoline fractions of exceedingly high anti-knock value. The standard for 100 octane rating is isooctane, and this compound is one of the chief products of the catalytic processes. Several refineries now produce this type of synthetic, almost perfect gasoline, which is used in highly efficient aviation engines, and it is important to note that it results from the utilization of the previously low-valued gaseous by-products.

The February issue of "Fortune" Magazine contains an excellent article on the Houdry process. This is a new catalytic cracking procedure which converts the low-value high boiling products of petroleum distillation to gasolines of high anti-knock value. This is important economically because it increases sharply the yield of gasoline from crude oil, reduces the output of low value fuel oils and tars, and gives the refiner better control of his output.

For several years the industry also has been investigating and operating on a commercial scale the catalytic hydrogenation of various petroleum fractions, cracking sometimes being an accompanying process. Here again motor fuels are improved in quality and the yield from crude oil is very high. In fact under ideal conditions, not yet attained commercially, more than a gallon of gasoline now can be obtained from a gallon of crude oil.

Chemical developments in the improvement of lubricants also have been notable. The hydrogenation process applied to certain low grade lubricants has reduced the content of unstable unsaturated compounds, yielding motor oils of higher lubricating value and very much improved stability at gasoline engine temperatures.

Perhaps most startling of the petroleum industry developments is the introduction of extreme pressure lubricating assistants. The addition of one or two per cent of certain relatively simple organic compounds to the usual

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**E. I. du Pont de Nemours & Co., Inc.

motor oils increases the film strength, and hence the lubricating properties, as much as 200 per cent. Tri-cresyl-phosphate, a well-known plasticizer for celluloid type materials, is one of the most common EPL bases. The very close machining of the silent transmissions and differentials of our new motor-cars are made practicable by the development of these extremely efficient lubricants. In addition, better construction of other machinery and longer life will result from these new products.

The petroleum industry also has been developing new outlets for its products, usually by chemical conversion to materials already of importance in industry. Certain petroleum hydrocarbons now are converted to alcohols, ketones, and esters for use in lacquers and other solvent outlets. In addition, catalytic processes have been developed for converting the aliphatic hydrocarbons present in petroleum to the very important aromatics such as benzene, toluene and naphthalene. These new sources of essential raw materials previously obtained from coal tar only, of course are important to the dyestuffs and other organic chemical industries.

One of the most surprising petroleum developments at present is practiced in Germany. This consists in converting paraffin fractions into long chain aliphatic acids. These acids are converted to soaps and other industrial products, thus conserving edible fats. They also have been esterified to fats practically identical with those obtained from vegetable and animal sources. Surprising though it may seem, food products thus can be produced from petroleum.

REFRIGERANTS

The mechanical refrigeration industry is closely allied with the motor-car industry, and here again the organic chemist has made substantial contributions. Until recent years ammonia and sulfur dioxide were practically the only refrigerants used. Each of these is toxic and obnoxious if released in substantial quantities, hence their use in large refrigerating units has been hazardous. For example, several cities found it necessary to prohibit apartment houses from using single large refrigerating units, requiring small individual refrigerators in each apartment, in order that mechanical failure would release only a small quantity of refrigerant. The organic chemist now has synthesized a series of non-poisonous, odorless. non-inflammable refrigerants known as the "Freons." They contain fluorine, itself an exceedingly toxic chemical element, yet the products are entirely harmless. Various ranges of boiling point and other physical properties are available in the series, meeting practically every problem of the refrigerating industry. This development has increased enormously in importance with the advent of air conditioning. Of course, the heart of each such installation is the large refrigerating machine required for cooling. Without the new refrigerants, air conditioning of large buildings, apartments, stores, etc., would be attended by serious hazards.

DEVELOPMENTS FOR THE TEXTILE INDUSTRY

Probably the most publicized recent organic chemical development is nylon, the new synthetic fiber. This material is related closely to silk and wool in its chemical constitution, yet it will be produced entirely from coal tar intermediates. Its physical properties excel those of the natural fibers, and extensive replacement of silk and perhaps other fibers is expected. As is usual in most organic chemical developments, it is expected that ultimately this material will be much cheaper and much better than the natural materials it will replace.

Many other synthetic fibers have appeared in recent years, among them Lanital, a synthetic wool produced from casein obtained from milk; Wollstra and Vistra, synthetic wools of cellulosic origin; Cisalpha, a modified viscose rayon; and Vinyon, another synthetic polymer of vinyl chloride and vinyl acetate. Many of these new fibers, when used alone, produce textiles inferior to those obtained from the conventional cotton, wool, silk and rayons. Nevertheless, when used in admixture with the older fibers, new fabrics are obtained which are most attractive in appearance and properties and therefore will be of great importance in the future.

Another activity of the organic chemist in the textile field is probably all too familiar to most of you. I refer to the almost endless list of new auxiliaries for textile processing: wetting-out agents, detergents, surface finishes, mercerizing assistants, warp sizes, water repellents, and so forth. I shall not bore you with a long dissertation on these materials, but one or two of the recent developments deserve comment.

The first real attack on soap as the accepted detergent occurred with the introduction of the fatty alcohol sulfates, best known to you as the "Gardinols." While arguments ensued as to the value of these products as compared with soap from a cost standpoint, it was demonstrated quickly that for certain effects and under many conditions of processing, these products had a definite and important place, regardless of the outcome of arguments on cost. Recently, new detergents have appeared at much lower cost, and the fatty alcohol sulfate types have been reduced sharply in price, due chiefly to improved manufacturing processes. There no longer can be much argument about the "money value" of the synthetic detergents. Broadly speaking they are competitive with soap. Furthermore, I can assure you that the chemical nature of the recent products is so simple and the raw materials are so plentiful and cheap, that further price reductions may be expected. I believe that it is a safe prediction that before long, all of you will agree that synthetic detergents are fulfilling the chemists' boast: that synthetic products eventually perform a better job at a lower cost than the materials they displace.

Another product deserving notice is the new water-repellent finish for textile materials invented in England

by chemists of Imperial Chemical Industries, and now being manufactured and sold in this country under the trade name of "Zelan." This material is a water-soluble long chain quaternary-ammonium salt, which, when applied to textile materials from a water solution, produces a water-repellent effect highly resistant to laundering and dry cleaning. This effect is not one of water-proofing, and the character of the textile materials is not altered as is the case in the usual water-proofing process. The chemical nature of the effect is not fully understood, but it is known that a resin-like material is produced and that the fabric itself may take part in the chemical reaction.

Perhaps you expect me to have a great deal to say about new dyes. If so, you will be disappointed. However, two or three developments are worthy of note. Recent years have seen many new dyes in the established chemical classes. Likewise, the application of naphthol colors has gained tremendously, particularly in printing. As a result of the introduction of these colors in new forms—the Rapidogens, "Diagens," and Pharmasols—the production of brilliant, highly-colored patterns of fairly good fastness properties has become more economical with a resulting tremendous increase in the use of color on textiles.

A second important development has been the improvement of textile printing with lacquers. Our best known printing ink organization in recent years has applied its talents to the problem of color printing of paper with new inks which will dry rapidly enough to permit mass production of lithographic effects. The covers on "Time," and the overnight rise of "Life," illustrate their success. This same organization applied the principles of resin inks to textile printing. Instead of producing textile prints by the application of substantive colors, pigments are bound to the fibers by practically colorless resins, which are so soft (plasticized) that the layman has difficulty distinguishing the new work from the old. However, taking advantage of the fact that in certain shades, pigments are faster and more brilliant than the best orthodox colors, new effects are obtainable in some cases, and in others the old effects are lowered in cost by the lacquers. The development is far from a finished job, but we all realize that it will find a permanent place, at least in some phases of textile printing. The development illustrates the occasional brilliant ideas which result from the introduction of the principles of one art into another.

To the chemist, the most spectacular development in dyes has been the development of the so-called phthalocyanine pigments—new blues and greens of unprecedented brilliance and amazing fastness to light, heat, alkalies, acids, solvents, and other destructive influences. In one sweep, blue and green pigments rose from the poorest to the best in the color spectrum. These pigments already are being used in paints, lacquers, printing inks, rubber, linoleum, pigment colored acetate, wall-paper coating, paper dyeing, and the endless other pigment outlets. The brilliant blues and greens found in the new lacquer prints also result from these pigments. All of you may be interested to know that John Thomas (now dead) of Scottish Dyes, the inventor of Jade Green, also was one of the discoverers of the phthalocyanines. Up in our part of the country, bright blue and green shutters are appearing on the new homes—and they are staying blue and green instead of fading. These new pigments bid fair to give all of us a new interest in bright colors out of doors.

DEVELOPMENTS IN PLASTICS

All of you probably have read enough and heard enough about plastics to be bored by the very term. Nevertheless, new materials of this type continue to appear and find new places in the industrial picture, and I believe you will be interested in one or two of these products.

"Lucite," a plastic polymer of methyl-methacrylate, is crystal clear and has a very high refractive index. You may have seen its use in reflectors on highways, giving a new cheap source of illumination which promises to add materially to highway safety. The product also has the property of "carrying light around a corner." Dentists are thinking of pointing one end of a bended rod into our mouths, applying intense light at the other end, and obtaining very high illumination without the discomfort of heat. This plastic also is the basis for the new eyeball eyeglasses. I could go on to describe the use of "Lucite" on automobile dashboards, toilet articles, advertising devices, and so on, but you probably have seen these uses already.

A second plastic which is receiving great attention is "Exton"—the new fiber nylon in the form of a plastic. The bristles in the "Miracle Tuft" toothbrush are composed of this material. We have been using the brushes for over a year, and are still trying to wear out the first one. The fact that the brushes can be boiled for sterilization and are unaffected by any of the usual bathroom materials indicates that a real contribution to tooth cleanliness and brush economy has been made. It is only a matter of time until all sorts of brushes will be produced from the material. The excellent resistance of the plastic to acids, alkalies, solvents and heat will result in much longer life for brushes subjected to severe conditions. In addition, you fishing fans will be able to use "Exton" leaders this summer, and nylon fish lines also will be available soon.

Bakelite and urea-formaldehyde type plastics were the whole show a few years ago. Now you now see vinyl plastics in safety glass, soy bean plastics as gear shift knobs in your cars, alkyd resins in various surface finishes such as the "DeLux" on your car, and novelties fabricated from polystryrene. Perhaps the future of plastics is predicted by the recent disclosure of an entire airplane fuselage and wing constructed of these materials, with the first real promise of low cost mass production of planes.

DEVELOPMENTS IN THE RUBBER INDUSTRY

Neoprene, the first of the synthetic rubber-like materials, now has been on the market for several years. In this period, remarkable improvements have been made in the quality of the product, and the cost of manufacture and selling price have been reduced. You may be interested in some of the uses which have developed for this material. Nearly all of them depend upon the unusual properties of Neoprene, namely, its resistance to heat, organic solvents and swelling agents, and deterioration in the presence of oxygen. The material is used for rubber connections, gaskets and engine mountings in automobiles; in gasoline filling station hose which previously was constructed of fabric only because gasoline very quickly swells and ruins rubber; for flexible lines to carry solvents in the chemical industry; and even in the bulbs of medicine droppers. The economic importance of this development is apparent when it is remembered that the British and Dutch attempted to fix the price of natural rubber at $1.00 per pound some ten years ago. This price fixing collapsed during the depression, and even today natural rubber sells under 20c per pound. Of course, the big use for rubber is in automobile tires and Neoprene is not being used in tires today. However, it can be made suitable; and it is almost inevitable that if rubber again even begins to approach the $1.00 per pound price, it will be replaced in the tire industry by the synthetic product.

Few new chemical products remain without competition for any appreciable length of time. This has been the experience of Neoprene. "Thiokol," a reaction product of ethylene dichloride with sodium sulfide, is another solvent resistant rubber-like material which is used in large quantities in many of the same fields as Neoprene. Likewise, the "Bunas" developed in Germany have similar properties and are competing in the synthetic rubber industry. It is of interest to note that the research on synthetic rubbers from butadiene has been going on for almost 50 years, and a little material of that type was produced in Germany during the World War but its properties were very poor in comparison with natural rubber. However, spurred by the success of Neoprene, the same German chemists now have produced butadiene interpolymers with other materials such as acrylonitrile, yielding the Bunas which are of real merit.

A recent development in the rubber industry is the production of transparent material of "Cellophane"-like properties. The product is known as "Pliofilm." It is finding use not as a flexible wrapping film, but also for protecting the human being by way of feather-weight raincoats, umbrellas and the like.

The rubber industry continues to progress in the development of rubber products of increased durability. Many of the advances in the way of increased strength and mileage in automobile tires have come from organic chemical developments; namely, the development of better anti-oxidants, accelerators, etc. Probably most of you remember that 20,000 miles was considered good mileage for an automobile tire back in '29, and today you are equally happy if a tire runs 20,000 miles. At first thought, this indicates no progress. However, it should be remembered that the automobile of today is much heavier and more powerful than that of 1929, and the ability of tire manufacturers to hold mileage relatively constant actually means that the tires have improved tremendously. In fact the tire of today on a car of 1929 probably would run 50,000 miles.

Another notable contribution to automobile tire construction has been the introduction of rayon into the fabric of the tire. We organic chemists, of course, claim viscose rayon as one of our accomplishments. The chief destructive influence in the tire of today is the heat generated by internal friction, and the rayon cord is much more resistant to this influence than the cotton product.

DEVELOPMENTS OF INTEREST TO AGRICULTURE

At the same moment that the organic chemist is attempting to replace natural products by synthetic materials, he also is aiding agriculture, particularly in the following two ways: (1) More use is being made of agricultural products as raw materials in the chemical industry, (2) the chemist is increasing the productivity of agriculture by the development of new fertilizing materials and agents to combat destructive pests. As examples of the first contribution, mention can be made of the tremendous increase in the use of cellulose in the manufacture of the synthetic textile fibers, the use of soya bean oil in plastics and of china wood oil in resins, paint and lacquer products, and the production of butanol and acetone from corn.

Both the farmer and the city gardener seem to be confronted with an ever increasing number of insects and fungus pests. The organic chemist has provided specific agents for the control or elimination of many of these in the farm and garden. One of the major objectives in this work has been the production of materials destructive to the pests but harmless to humans, and considerable progress has been made in this direction.

In looking forward to the next big change in our life, one cannot help but be impressed by the potentialities of the new "aquaculture." To the uninitiated this is the name applied to the rapid, forced growth of plants in water media instead of in the soil. As you probably know, tomatoes approaching the grapefruit in size are being grown commercially under this system. The productive capacity of a few square feet in the greenhouse is equal to that of an acre of farm land; and as much growth is accomplished in a day as is normally expected in a week. Choice flowers also are being grown under these conditions. Experimentally, almost every type of plant has been cultivated in the supported water media, with the chemical feeding which is necessary in this process.

Another phase of this agricultural development is the study of plant hormones. By the use of almost infinitesimal quantities of certain organic compounds, plant cuttings can be made to root out in a matter of hours. It is particularly startling to see roots on both ends of a plant, obtained by this means. It is difficult to predict how far this development will go, but it seems inevitable that sooner or later our large cities will have great varieties of fresh fruits and vegetables of superb quality available at very low prices. Further, the specialties of the tropics may be enjoyed in Alaska, and the reverse also could be true if the Arctic had any agricultural delicacies. It is doubtful, however, if heavy farm products such as wheat and corn can be grown economically under this mass production system.

DEVELOPMENTS OF INTEREST TO MEDICINE

Just as the organic chemist is interfering with plant life, he continues to produce materials affecting human life and comfort. Of course, the use of organic chemical products in medicine is very old. Our present-day anesthetics, pain-killers, antiseptics and other medical and pharmaceutical products have resulted chiefly from the work of the organic chemist.

Among the recent developments of unusual interest are the much publicized sulfanilamide and its recent relative sulf-pyridine. Sulfanilamide possesses a property known in few other compounds, that of diffusing into the entire human body whether taken orally or by injection. It has strong antiseptic properties toward certain organisms and has been found exceedingly effective in combating certain infections against which the medical profession has been previously almost helpless. For example, the mortality in certain types of pneumonia has been reduced almost to zero. In the short time in which sulfanilamide has been used, organic chemists over the entire world have been preparing numerous analogous compounds. From this work has come alpha-(p-amino-benzene-sulfonyl-amino)-pyridine, colloquially termed "sulf-pyridine." This product has been found most effective toward additional varieties of pneumonia previously almost always fatal.

We all are troubled with winter colds and undoubtedly all of you are familiar with the sudden popularity of "nose drops." The active principal in these products usually is synthetic ephedrine, another recent accomplishment of the organic chemist.

The organic chemists of the world today are more active in their scientific researches on natural products and processes than in any other field. The much publicized developments in vitamines and hormones have resulted from these studies. Nearly all of the elusive vitamines now have been produced synthetically in the laboratory, and in some cases the synthetic products are more economical than the natural materials. The hormone studies have resulted in treatment of numerous glandular disorders by the administration of synthetically produced hormones, deficiencies of which in the systems have caused the disorders. Perhaps of little commercial interest, but certainly of scientific interest, is the work on sex hormones, as well as the synthetic production of the fertility vitamine E. The future organic chemical research in the field of medicine probably is in the direction of further materials to combat physical deficiencies as well as transitory illnesses. Perhaps the dictator nations will have their way in the development of improved races, not by way of purges, but through chemical tinkering with natural processes.

CONCLUSION

I could go on for hours telling you more of the details of the developments mentioned, or in bringing to your attention additional activities of the industrial organic chemist. However, I believe you should be convinced by now that organic chemical developments are having an important influence on your necessities and luxuries; and that, far from being only a magic practice in the laboratory, organic chemistry is a full grown industry essential to our present day ways of living.

MEETING, SOUTHEASTERN SECTION

THE Southeastern Section met at the Atlanta Athletic Club, Atlanta, Ga., on Saturday evening, May 20, with an attendance of 77 members and guests. Dr. F. Bonnet of the American Viscose Corporation, Marcus Hook, Pa., was the technical speaker, discussing "The Dyeing of Rayon Staple." Following Dr. Bonnet's paper there was some discussion of an informal nature with reference to this subject.

The other speaker was Thomas H. Quigley, head of the Industrial Education Department of the Georgia School of Technology, Atlanta, who spoke on "Democracy and Efficiency." Dr. Quigley pointed out that in the preservation of a Democracy, when inflation of the currency becomes necessary, it is essential that industry improve its efficiency and the capacity of its workers to such an extent that production and efficiency will rise at the same time in order to offset the effects of inflation.

Robert W. Philip, Editor of *Cotton* and Chairman of the Section, was in charge of the meeting. Perrin N. Collier, Vice-President and Director of Research, Callaway Mills, LaGrange, Ga., reported briefly on his attendance at the meeting of the National Council and Research Committee in Philadelphia in April. Announcement was made of the annual summer outing of the South Central Section to be held at Lookout Mountain Hotel, Lookout Mountain, Tenn., August 4-5; and an invitation for members of the Southeastern Section to participate was extended. Announcement was also made of the National Convention in Boston on September 15-16 and considerable interest was shown in this meeting by members of this section.

Respectfully submitted,

W. F. CRAYTON, *Secretary.*

The Economic Situation*

W. M. McLAURINE**

THE National Industrial Conference Board, in a bulletin issued February 9th, 1939, states that there are three fundamental reasons why recovery in the United States is so slow.

1. *"Idle Men.* Since 1930, the waste of labor time through unemployment reaches the appalling total of 80 million work years. This problem becomes constantly more acute because growth of the population adds about 600,000 new workers each year to the labor force."

2. *"Idle Machines.* Despite agitation for the 40-hour week, the average work week in manufacturing industries has not attained that level since 1931, and since 1932 has been eleven hours less than that in 1929, the peak year of our prosperity. Idle men and shorter hours mean idle machines. Today, the machines which do the greater part of the work performed in modern industry stand idle about one-fourth of the time they were in use in 1929."

3. *"Idle Money.* The amount of money lying practically idle is greater today than at any previous time in our history. We have more money to lend for productive purposes than ever before. The proportion of loans to our total bank deposits and net capital funds averaged 39 per cent for the last five years, against 63 per cent for the preceding eleven years. The surplus of bank deposits and net capital funds over total loans and investments has more than trebled in the last five years."

Thus bodily I have lifted three pertinent and graphic paragraphs out of this bulletin. Now I shall proceed with the same bulletin to portray certain other facts. In order to achieve a full employment of the labor force as of 1929, we must have employed the number employed in that year increased by more than six million, since 600,000 new workers come into the the picture each year.

While the group of production occupations, which includes manufacturing and mechanical industries, mining, lumbering and fishing, has increased during the last few decades, the number of workers in distribution and service occupations has increased much more rapidly. There has been a steady decline in the proportion of the production occupations to the total.

There has been a noticeable decline in both agricultural and in the manufacturing and mechanical industries.

In factory industries alone, according to the Census of Manufacturers, the actual labor requirements was much less in 1929 than it was in 1919. If the trend continues and it seems likely, the center of interest in labor problems will shift more and more toward agriculture, distribution and service and less toward the factory industries, on which nearly all reform measures have been focused at the present.

Taking 1899 as a standard and saying that 100 per cent of man hours would turn out 100 per cent of production, in 1938, 96 per cent of these same man hours would turn out 208 per cent of manufacturing production.

In 1938, the requirement of man hours of labor in proportion to output was 46 per cent of that in 1899. To be entirely specific and refer to the cotton textile industry, Table 30, page 47, of Bulletin 663, issued by the U. S. Department of Labor, Bureau of Labor Statistics, the index of output per man-hour in 1928 was 85, in 1937 it was 129, or an increase of nearly 50 per cent.

The average index of man-hour production in all industries, at the present stands at about 117 per cent above the 1899 level. It is not likely to decrease. Indications are that man-hour production will increase.

This man-hour output is often confusing. It has two pet characteristics. One is the increased efficiency of labor and the other is the work load or more commonly called "the stretch out." The efficiency of machines is often forgotten.

Most scientific writers and students of labor recognize that labor in many cases is not as efficient as it was many years ago. The transfer of skill has been from the laborer to the machine. Most labor today is only machine tending and the speed and efficiency of the machine accounts in a large measure for the increased output.

In 1937, with at least 10 million less spindles in place than at the peak, the cotton textile mills of the nation consumed approximately 8 million bales of cotton with almost 100,000 less employees than were had at the peak employment in the industry, and to my knowledge, there was not a single controversy over work load or "stretch-out."

Competition has made it necessary for machines to be automatic and efficient. Carl Snyder, one of the foremost authorities on industrial and economic problems, says:

"It is obvious that we cannot have any general gain of wealth, comforts and enjoyments for the whole nation save by a definite increase in the product per worker; no other way. But this, we now know, does not usually mean any fabled gain in the 'efficiency' of the workers. There may be a little, but only that. It may be doubted if, on the average, the workers of today are more industrious, skillful or 'efficient' than those of a century ago. Practically the sole gain in product is through improved machinery, new processes, new inventions and discoveries.

*Presented at meeting, Southeastern Section, Feb. 18, 1939.
**Secretary-Treasurer, American Cotton Mfrs. Assn.

This is precisely what is meant by the Industrial Revolution."

Thus the picture of factory employment reveals itself to the public mind, to the employer and to the employee, as economic pressure, science, technology and power make modifications necessary and possible.

It also shows to the world that distribution and service employments are the most open and inviting fields for future hopes and ambitions.

There will always be a demand for agricultural and factory employment but these opportunities are not growing as rapidly as production demands or possibilities may indicate. Unemployment in 1938 was higher than in any years of the past, except 1932 and 1933.

The unemployed in 1938 amounted to 20 per cent while in 1932 and 1933, it amounted to 25 per cent, which gradually fell to 13 per cent in 1937 and then back up to the percentage indicated. It has been estimated that we have a total net loss from unemployment of approximately $55 billion since 1930.

If we assume that in 1899 the contribution of labor was 50 per cent and that by machines was 50 per cent then the corresponding figures for 1938 are labor 25 per cent and machines 75 per cent.

If we assume that in 1899, the contribution by labor was 60 per cent and that by machines was 40 per cent, then the corresponding figures for 1938 are labor 33 per cent and machines 67 per cent.

When we state that the work week has been reduced 13 hours since 1929 it means that men and machines are idle.

Labor has enjoyed leisure and recreation. Machines have grown obsolete and depreciated. Overhead and interest charges have also continued.

The work week in 1929 averaged 48.3 hours.

The work week in 1938 averaged 35.2 hours.

The surplus for investments has grown from $2.9 billion in 1929 to $10.5 billion in 1938.

Loans have decreased from $41.5 billion in 1929 to $21.1 billion in 1938.

The percentage of the surplus over actual loans and investments has increased from 4.7 per cent in 1929 to 18.2 per cent in 1938.

This is largely an industrial picture and should be balanced with the agricultural situation in order to show more closely the economic situation.

In order to show that industry and agriculture are intimately related, I am quoting from another bulletin of the National Industrial Conference Board, issued January 11th, 1938, on the subject, "Do Reduced Crops Increase Farmers' Income?" This also indicates how farmers adapted themselves to conditions before the government intervened with its program:

"Because nearly a third of the nation's farmers earn income from work away from their farms, the adjustment because of part-time farming is extremely flexible and is sensitive to general conditions, industrial activity and employment, prices and demand for farm products, and other factors. According to the Agricultural Census, more than 30 per cent of the farmers earn money by working off their farms. In 1934, the average for over 2,000,000 farm operators was 97 days worked off the farm. About one-fourth worked 150 days or more away from the farm, and were probably industrial, professional, clerical or other urban workers, living on farms to supplement their labor incomes. The other million and a half part-time farmers were apparently engaged in farming as their principal means of livelihood and were earning more or less additional income by other employment.

"Since over 30 per cent of the nation's farmers add to their farm incomes by working at other occupations, these part-time farmers are obviously in a position to make rapid adjustments in their agricultural production. In depression years part-time farmers undoubtedly increase their production of farm produce, either for their own consumption, or for sale, thus limiting the market for produce from full-time farmers. When industrial employment rises rapidly, on the other hand, many part-time farmers may largely abandon farming."

Since we have followed the National Industrial Conference Board's analysis this far in making the picture, there may be two further questions that need answering analytically. Why are these conditions and what can be done to relieve them?

We can go back and study the various reasons assigned by economists and politicians as to the why. We can brief them and re-brief them and then disagree.

If I had the answer to what can be done to consume the idle men, idle machines and idle money, I would be a national figure and a wizard of economics.

It may not seem presumptuous to try to outline a few causes and indirectly the cure of the causes may indicate a positive policy of progress.

In the first place, and it is commonplace, we have never settled from the cataclysmic debacle of the World War which upset all of our traditions and patterns of life. Practically every mode and tradition was upset. Our habits and customs were all cut across in a storm of emotion and novelty of experience. This, together with the rapid strides of progressive technology, practically destroyed the plan and pattern of the environment in which we lived and after the storm of emotion and the novelty of the new experiences had swept by, when we went back to pick up where we left off, nothing looked natural, or at least there had been so much change that fear came in and prevented sane thinking. The mob-mind of self-preservation and chaotic thinking prevailed.

Again, the scientific age of life was already making its inroads on the life and customs of the people and gradually but surely, and sometimes painfully, adaptations were being made. The American people are noted for their power to finally adapt and adjust themselves to their

environment, or to state it conversely, to change their environment to fit their lives. It may take time and cause travail but history shows that ultimately this has been the case.

I quote you two paragraphs from the study above referred to by the National Industrial Conference Board to prove that national adaptation has worked:

"The agricultural history of the last sixty or seventy years in the United States indicates that there is no basis for the assumption that reduced crops of the leading products tend to increase farmers' income. Available evidence, presented for wheat, cotton and tobacco, points to the conclusion that, although a smaller-than-usual output raises prices, it brings a smaller actual return to farmers more frequently than a greater return.

"In studying agricultural production over the past forty years, it is evident that farmers have frequently made rapid adjustments both in land use and in shifts to other occupations. Geographical shifts in crop acreage, the growth of population, changes in export demand and similar factors are responsible for long term adjustments. Short time adjustments in agricultural production are largely affected by industrial depressions, by the extent of part-time farming and by the necessity for planning months ahead on farms. As far as can be judged from experience both during the Farm Board's administration and thereafter, government intervention tends to prevent normal long-term adjustments by farmers.

The point I am here trying to drive home is that there has been a terrific dislocation. We have had dislocations before and the social and economic minds of the nation have been sufficiently intelligent to make the adjustments.

The present dislocation, because it was so terrific and upset so many customs and traditions, was seized upon by theorists and dragged into the artificial laboratory of experiment with the idea that law could do more quickly what human nature would ultimately do more slowly.

These theorists have prevailed upon the government to work out panaceas and policies which freeze action and frighten individual initiative. We can now look back upon practically every panacea proposed to find that it has ultimately worked harm, although temporarily it may have been good.

This government intervention of social and economic theory, with a positive program of action, has done several things that have proven disastrous.

1. It has rather decidedly developed the philosophy that man, individually, is unimportant and, therefore, irresponsible. The government is the all-wise and all-powerful factor in solving social and economic ills.

2. This has destroyed for too many people energy, ambition and personal responsibility. In the song of the negro, "Jesus Leads Me, the Government Feeds Me and It Ain't a'gwine to Rain No More."

3. Those enterprising and forceful leaders who realize that slow and frequent changes must be made to readapt to the new conditions, find their acts and desires either prevented or frozen by some government legislation or ruling. In the diversified life of this nation and operating in widely diversified areas elasticity and freedom of action is absolutely necessary. Economic law, drafted by any government agency, is too slow and too rigid to be beneficial for any protracted period.

4. The shifts of employment from agriculture and factory to service and distribution has never been fully appreciated by the government, hence the people who follow the government's leadership do not appreciate this fact. Too many people are waiting for industry and agriculture to absorb workers that are doomed in their waiting. They must look elsewhere and prepare themselves vocationally for other positions. Technology and science are at work in agriculture, as well as in industry. Too many like Micawber are waiting for something to turn up and it will never turn.

5. Our international politics and foreign relations program are too uncertain and too vacillating to cause idle men, idle money and idle machines to be put to work. The constant threat of war either immediate or remote, hangs over the industrial horizon.

6. The uncertainty of profits made so by the general attitude of the government, and specifically by its program of taxation and spending, is a great deterrent. When the chances for profits are 51 per cent and those for losses are 49 per cent, business steps out and we may even say that when chances are even business will go forward.

Now there are so many regulations and so many uncertainties that money and people are afraid to venture.

7. The analysis could go on further but the above statements are enough to indicate reasons for failure to recover. Plans have been too temporary and expedient, too rigid and unintelligent.

This brings us to the last question, what can be done to inspire confidence, so that the idle factors of life can get busy?

I shall not attempt to answer only in general statements which may admit of various interpretations and adaptations. The social and economic life is too broad and diversified to be regimented. The artificial barriers supposedly to assist social and economic life, are retarding it. It may sound hard and cold and severe, but social and economic life must make its own adaptations unhampered by artificial restraints or compulsions.

Cooperation and civic consciousness can not be commandeered or legislated. When individuals and groups and communities get themselves adjusted then the nation is adjusted. The nation can not adjust and then work from the top down. If this nation is ever saved, it must be saved from the bottom up.

We must stop watching Washington and make our own lives and personalities safe and we must not be dictated to in so doing.

I thank you.

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COTTON, SCIENTISTS AND FATALISTS

RECENTLY launched research programs to promote jute as well as the appearance of many new synthetic fibers or modifications of older synthetics should make us pause anew to consider cotton. While an individual may think as a cotton man, or as a competitor, we must not forget that cotton is one of this country's very largest and most important agricultural and manufacturing industries and that we all have a more or less direct interest in it.

Cotton still represents the world's largest textile industry. It is still tons and tons ahead of any competitor but we begin to wonder for how long. In every new issue of a textile or chemical journal we are prepared to find a new competitor evolved by chemistry and ready to take over the job of some natural fiber, too often cotton.

We have always thought of cotton in bales and other fibers in pounds but the ratio is already slipping, under the onslaught of other fibers of high and low degree.

Cotton suffers from its inferiors such as paper, and now jute is coming to life with scientific research programs to help maintain its position and, naturally, to expand. While it may expand somewhat into the field of paper and other wrapping materials, it must look with covetous eyes at some of the large uses of cotton. Meanwhile cotton does not seem to be getting very far for wrapping cotton bales in preference to jute.

To look ahead a bit, if jute can be used in road construction in India in preference to Indian cotton, what will be the situation here? The use of fibers in roads has "caught on." We think it is at least rumored that they are trying wool in Australia as a reinforcement for highways, and an enterprising American already has a patent on the use of glass fabric in roads.

The alarming (if you are a cotton man) increase in synthetic fibers is most strikingly brought out in the October 20 News Edition of Industrial and Engineering Chemistry. This publication has rather frequent notes on fibers from various sources particularly those of synthetic origin. We never counted them before in any one issue but in this particular one found some mention of about a dozen man-made fibers. Some are established successes while some are little more than theories but there they stand. Some are frankly aimed at wool or silk but we know too well that any serious disruption in these fields is likely to reflect back on cotton.

There were rayon (including acetate, cuprammonium and viscose), glass fibers, Lanital, fibers from soy bean protein, and purely synthetic Fiber 66 or Nylon. Vinylite was also mentioned although we did not notice its offspring, the new fiber Vinyon. There may have been others but there would seem to be plenty of headaches for cotton men in this list as it stands.

Some of these fibers will go into clothing while others will replace cotton in mechanical uses such as filter fabrics.

One company is stated to have produced enough rayon in 1937 to make seven dresses apiece for every woman in the United States of more than fifteen years of age. This rayon was not all actually used in that way, but it must have done something to the cotton piece goods business.

The world production of synthetic fibers in 1937 was equivalent to about a million and a half bales of cotton in weight, although not necessarily in use.

Italy has about fifty plants which manufacture synthetic fibers and "treat thread." Fiber has been produced from the bark of the mulberry tree and is called gelsofil. Cisalfa and Sniabeta are fibers made from cellulose mixed with animal protein.

While a little aside from our main theme the Lanital process has been licensed in Poland, France, Belgium, Germany, Japan, England, Canada and elsewhere.

There was Cordura rayon for tires. Here cotton is already fighting with claims of greatly improved tire cords. Cordura for sails may be another matter.

Nylon is an obvious competitor for silk, but how about the cotton in the feet and tops of women's hosiery where cotton yarn is still used? The cotton yarn man will be forgiven for wondering a little, and perhaps for a little worry.

We do not know whether research will be the answer but it seems like the best of cotton sense to oppose research of competitors with more research on cotton. If cotton is not the best fiber for a given purpose if will not be used and we cannot expect it to. But, every effort should be made to make up the deficiency by finding new uses or modifying cotton to fit new uses. At any rate, let our attitude be that of the scientist, not that of the fatalist, lest we end up witl. a large sized fatality.

Textile Testing—

(Continued from page 310)

The instrument should be calibrated by means of a liquid of known fluidity and density which flows slowly enough to cause very little error by kinetic energy effects; glycerine solutions are of such a nature. If we let

F = fluidity in reciprocal poises at 20° C.
d = density in grams per cubic centimeter at 20° C.
t = time of flow in seconds
K = the constant of the instrument

Then $F = K/dt$ or $K = Fdt$

and if we take a glycerine solution of such composition that

$d = 1.1681$

and $F = 6.83$

then $K = 1.1681 \times 6.83t = 7.98t$.

Theoretically this should receive a small correction for kinetic energy, but this is usually neglected. The value of K, if the instrument is made according to specifications, should be roughly 2000. The total volume (V) of the viscometer in cubic centimeters with the clamps in place should also be obtained by weighing empty and then weighing full of distilled water; this volume will be roughly 20 cc. The values of K and V for each instrument should be recorded in the laboratory log-book.

The cellulose sample is dissolved in the viscometer in which its fluidity is to be determined, using a 0.5 per cent solution for cottons and a 2 per cent solution for rayons. Since it is difficult to get exact weights of dry sample we usually make the solutions approximately of this strength and afterward correct the results to the correct concentration. The sample, then, about 0.1 gram of cotton or 0.4 gram of rayon is weighed out and at the same time another sample is weighed out for the regain determination. A small amount of cuprammonia solution is placed in the viscometer, the bottom clamp opened to fill the capillary, the sample (preferably cut up into short lengths) is added, and 0.7 cc. of mercury run in from a buret (to stir the solution). The viscometer is filled to the top and the stopper added, the excess cuprammonia running out the top capillary which is then closed with the clamp. The viscometer is then wrapped in a black cloth to prevent light damage and placed on a wheel which revolves at 4 r.p.m. until the cellulose dissolves—this is usually over night.

When the cellulose is all dissolved, the bottom tubing and clamp are removed, the viscometer is placed in its support which in turn is in a constant temperature bath at 20° C. and allowed to come to constant temperature. When constant temperature is arrived at, the top clamp is opened and the mercury runs out, followed by the cellulose solution. The time for the level to fall from the top ring to the bottom one is measured with a stop-watch. The fluidity is then calculated from the formula:

$$F = K/dt$$

where d may be taken as 0.94 and K has already been determined, so that

$$F = K/.94t$$

Theoretically this also should have a correction for kinetic energy but this is not usually done because it is small. The concentration of the solution in per cent is calculated from the dry weight of the sample and the volume of the viscometer

$$C = \frac{100W}{V\text{-}0.7}$$

where C = concentration in % (weight/volume)
W = dry weight of sample taken in grams
V = volume of viscometer in cubic centimeters
0.7 = volume of mercury in cubic centimeters

To correct the results to the standard concentration we use the formula:

$$1 + \frac{A}{C} = \frac{B}{\log F_s/F}$$

where F_s = fluidity of the pure cuprammonia solvent = 72 poises
B = a constant = 11
and A = "concentration correction constant"

$$\text{Then } A = C\left(\frac{11}{\log 72/F} - 1\right)$$

Substituting the value of A just found in the formula and letting C = 0.5 or 2.0, according to whether cotton or rayon is being tested, the formula

$$1 + \frac{A}{C} = \frac{11}{\log 72/F}$$

$$\text{or } \log F = \log 72 - \frac{11}{1 + A/C}$$

gives us the value of the fluidity at the desired concentration.

A problem may make the calculations clearer: A certain viscometer has a viscometer constant of 1970 and a volume of 19.8 cc. A sample of cotton weighing .0985 gram and containing 3.85 per cent regain was dissolved and tested. The time of flow was 270 seconds. What is the fluidity of the sample in 0.5 per cent solution?

$$\text{Dry weight of sample} = \frac{.0985}{1.0385} = .0949 \text{ gram}$$

$$F = K/.94t = 1970/.94 \times 270 = 7.76$$

$$C = \frac{100W}{V\text{-}0.7} = \frac{100 \times .0949}{19.8\text{-}0.7} = 0.497$$

$$A = C\left(\frac{11}{\log 72/F} - 1\right) = .497\left(\frac{11}{\log 72/7.76} - 1\right) =$$

Then log

$$F = \log 72 - \frac{11}{1 + A/C} = 1.857 - \frac{11}{1 + 5.15/0.5}$$

$$= 0.883$$

or F = 7.6 = fluidity in 0.5 per cent solution.

Pure cotton cellulose in 0.5 per cent solution will range

in fluidity from 1-5, averaging about 2, it should never exceed 10 during manufacture; mechanically disintegrated cotton will be about 40 with the end of service at about 35. Rayons in 2 per cent solution will be about 7.5 and rayons damaged to the point of mechanical disintegration will be about 35. Rayons in 0.5 per cent solution will be 36-40 and disintegrated rayons about 60. Silk and wool show a fluidity of about 65 in 0.5 per cent solution, in case it is necessary to test mixed fibers. Typical values of the fluidity of rayons and cottons are shown in Table XVIII.

The advantages of the fluidity test over the copper number determination are:

1. It shows incipient damage.

2. It shows damage even after an alkali boil or laundering.

3. There is a direct relationship between increase in fluidity and loss in strength; an increase in fluidity of 10 reciprocal poises corresponding to 20-25 per cent loss in strength.

The disadvantages are:

1. A constant temperature bath is necessary.

2. Cumbersome apparatus and a source of nitrogen gas are necessary for storing the cuprammonia solution in an inert atmosphere.

3. A long period of time is necessary to dissolve the samples. In view of these advantages and disadvantages, the test is not much used unless a large number of tests are to be made as a routine or in research work where a very precise method of damage estimation is needed.

Other uses for viscosity or fluidity determinations in the textile industry include:

1. Analysis of cotton-rayon mixtures. Assuming the fluidity of cotton in 0.5 per cent solution to be 2 and viscose to be 36, the determination of the fluidity of a mixture gives a measure of the relative amounts of the two constituents. See Chapter 12.

2. Liability to damage. Clibbens and Little have shown that a sample of cotton goods which has been heated in an oven at 110° C. for 18 hours and which has a rise in fluidity of less than 3 reciprocal poises contains no injurious chemicals; a rise of more than 3 reciprocal poises indicates chemicals which may cause damage on storing.

3. Degree of ripening of viscose. The viscose solution before spinning may be tested for "ripeness" by a viscosity determination; the falling ball method is generally used.

4. Degree of esterification of cellulose. The degree of nitration or acetylation may be determined by measuring the viscosity of the ester in an appropriate solvent.

5. Suitability of starch pastes for printing. Recent work has shown that a Stormer viscometer may be used for predicting the suitability of a starch paste for printing.

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(To be continued)

TRADE NOTES • NEW PRODUCTS

• GEIGY RELEASE

Geigy Co., Inc., 89 Barclay Street, New York City, announces release of a circular describing the following product:—

Erio Fast Yellow 6 G—(patent applied for)—a new fast to light, level dyeing, acid yellow giving greener and brighter shades than the types of Fast Light Yellow 2 G and 3 G. It should prove useful for dyeing carpet yarns, knitting yarns and ladies piece goods. It is stated that, when used in combination with level dyeing, fast to light acid blues, it will be possible to obtain brighter shades of green with good fastness to light. It is said to possess relatively good fastness to washing and perspiration as well as very good fastness to stoving, formaldehyde, and chlorine (acid). It is suitable not only for wool, but also for unweighted silk and combination fabrics of wool and silk. It is suitable for shading chrome colors, the shade becoming a little greener and duller. Circular No. 971.

• BERNARD RELEASE

Bernard Color & Chemical Corp., 333 Hudson St., New York City, announces release of the following product, as Eastern representative of the Durotize Sales Corp., 2810 Superior Ave., Cleveland, Ohio:—

Durotize—a water repellent,—various types of which are said to be suitable for every fabric, fur, paper or other substances on which it has been tried. Although it is primarily a water repellent, it is claimed that it is also stain, spot and perspiration repellent, shrink proof, moth proof and mold proof and gives off no odor on the finished article.

• CIBA REVIEW

Ciba Review, Number 21, May 1939, has recently been issued. Featured in this issue is "Weaving and Dyeing in North Africa." Contents are described by the following titles: The Textile Craft of Egypt; Weaving and Dyeing in North Africa:—Morocco, Algeria, Tunisia; Historical Gleanings. Copies of this publication are available upon request to the Ciba Co., Inc., Greenwich and Morton Sts., New York City.

• JOINS A. C. P.

American Chemical Paint Company, Ambler, Pennsylvania, announces the appointment of Tom Cheetham as sales and engineering representative for the A. C. P. Wool Scouring Process. Mr. Cheetham was formerly associated with the Textile Division of Procter & Gamble Co.

● CIBA RELEASES

The Society of Chemical Industry in Basle, represented by Ciba Co., Inc., have issued the following circulars, announcing a number of new products and processes.

Brilliant Cyanine G—this product resembles Brilliant Cyanine 6 G, but is of a much greener shade. It is said to have very good fastness to washing, sea water, water, stoving, decatizing, perspiration, carbonizing and acid fulling. The fastness to light is claimed to be better than the ordinary acid blues, the resistance to chrome allows it to be used for shading the chrome mordant colors. Brilliant Cyanine G exhausts well on wool from a neutral Glauber's salt bath, hence may be used for shading the wool in unions and mixed fabrics. In wool and silk mixtures, both fibers are dyed to a uniform shade. Pure-dye or weighted silk may be dyed from either a weak acid or a broken soap bath. Effect threads of cotton or rayon are only lightly tinted, but acetate rayon is reserved pure white. Prints on wool or silk are said to be characterized by good fastness to water and washing. This product is suited for vigoreux printing and for discharge printing on wool and silk. Circular No. 496.

Ciba and Cibanone Colors on Viscose Rayon—this sample card illustrates 100 dyeings of two shades each of the Ciba and Cibanone vat dyes which are best adapted for dyeing rayons, with the exception of acetate rayon. The dyes of the highest degrees of fastness are suitably designated, the remainder of the series having special fastness properties which adapt them for various grades of work, where they will fulfill the necessary conditions. Sample Card No. 1620.

Cotton Dyestuffs, Free of Copper and Manganese—the dyes shown in this sample card have been selected for fabrics which are to be rubberized and vulcanized; it is stated that the dyestuffs are not only free from the metals in question, but are also able to withstand either cold or hot vulcanizing processes unchanged. Sample Card No. 1625.

Padding in unreduced state with Ciba and Cibanone Micro Powders, Pastes and Micro Pastes. (Pigment Padding Process)—this sample card shows a number of clear tones produced by the use of these products. Dyeing on the padder is mostly carried out in the case of light and medium shades in the staple tones and mostly on the lighter materials. Generally in such cases, on account of irregularly twisted yarns, the goods would show a very streaky appearance if they were dyed in the ordinary way, which makes padding a necessity. The dyeing costs are said to be lower and speed of production is greater. The padding operation is best suited for the fabrics which offer difficulty in penetration when dyed on the jig. Sample Card No. 1630.

Hosiery Shades on Wool, plated with Viscose Rayon—this sample card shows 72 dyeings on the following materials: wool, plated with bright viscose rayon; wool, plated with bright viscose rayon, with acetate rayon and immunized yarn effects; shading dyes for viscose rayon, which reserve acetate rayon; shading dyes for wool, which reserves acetate rayon; fashion shades on wool, plated with dull viscose rayon. Furthermore, dyeings are shown which produce fashion shades on mixtures of wool and bright viscose rayon, but reserve acetate rayon and immunized yarn. Sample Card No. 1635.

Chlorantine Fast Colors—the line of Chlorantine Fast Colors are shown on ordinary and mercerized cotton, cotton piece goods and viscose rayon. These dyestuffs afford the simplest way of obtaining colors fast to light. Those of the best fastness are designated "LL," those of good fastness "L." The remainder of the series are still considerably better than the ordinary direct dyes, yet do not carry the designation "L." Sample Cards No. 1650-1653.

Ciba and Cibanone Dyes on Silk—this sample card shows the types which are best suited for dyeing unweighted and chappe silk. The dyes are recommended for dyeing effect threads, shirtings, dress goods and embroidery yarns. Sample Card No. 1655.

White and Colored Discharges on Dischargeable Vat Dyed Grounds, without the use of hydrosulfite preparations—colored discharges on dischargeable vat dyed grounds with insoluble azoic colors were possible up to now, only by the use of chlorate discharge. The use of discharge colors free of hydrosulfite is made possible by the use of potash and Discharge Salt W Ciba, in the print paste. Sample Card No. 1670.

● OUTING, S.O.C.M.A.

The annual outing of the Synthetic Organic Chemical Manufacturers Association was held on Thursday and Friday, June 1st and 2nd, at Skytop, Pa. A fine turnout of golfers was on hand for the tournament held on Friday. Prizes were awarded to the following: D. C. Scott, R. E. Wilkin, R. E. Dorland, P. M. Dinkins, W. C. Hovey, H. B. Marshall and W. F. Harrington. Also, special prizes were awarded to J. H. Davis and M. C. Milliken for the lowest number of putts, to J. H. Karrh for the best approach to the 8th hole and to R. J. Grant for the longest drive on the 1st hole (245 yards).

The Union Dinner, held jointly with the Manufacturing Chemists Association on Thursday evening, was also an unqualified success with two hundred members and guests present. The guest speaker at this event was Dr. Robert C. Clothier, President of Rutgers University, who spoke on his conceptions of the job to be carried on by the universities.

● OUTING, S. O. M. A.

The annual outing of the Sulphonated Oil Manufacturers Association was held on Wednesday and Thursday, May 24th and 25th, at Seaview Golf Club, Absecon, New Jersey. An enthusiastic group of about 35 attended, including members and guests, and most of those present participated in the golf tournament. Fred Scholler, of Scholler Bros., Inc., president of the Association, won top honors with a low gross score of 89. Prizes were also awarded to the others who took part in the tournament.

A luncheon on May 25th brought the outing to a close. B. A. Schiller of the National Oil Products Co. was master of ceremonies at this event. Golf prizes were awarded following the luncheon after which a floor show was presented.

The outing was arranged by a committee under the chairmanship of "Lou" Grombacher of the Standard Chemical Products Co.

● BRITISH DYESTUFFS PRODUCTION

Production of dyestuffs in Great Brian during 1938 declined to the lowest level recorded since 1930, according to a report from Consul George Tait, Manchester, made public by the Department of Commerce.

Statistics just issued by the British Board of Trade show that the total output of synthetic organic dyestuffs in the United Kingdom during 1938 amounted to 45,502,043 pounds compared with 63,265,000 pounds in the preceding year, a decrease of 28 per cent.

Authorities attribute this appreciable recession in British dyestuffs production largely to the fact that the domestic dye-consuming industries had laid in large stocks of dyes during 1937 on the expectation of an advance in price. Other factors in the decline were the curtailed demand from the depressed Lancashire textile industry and the question of the use of certain shades of color, according to the Department of Commerce.

● GENERAL RELEASE

General Dyestuff Corp., 435 Hudson St., New York City, announces release of a circular describing the following new product:—

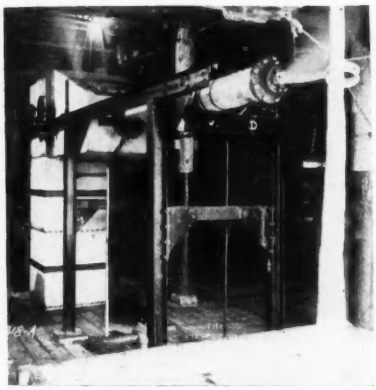
Dullit MG—a new agent for the delustering of mixed fabrics of wool, spun or glossy rayon. The agent goes mainly on the wool and sparingly on the rayon, making it possible to deluster mixed fabrics to resemble pure wool in appearance. It may be applied on the winch, jig or pad. Circular No. 1645.

• NEW CONTINUOUS BLEACHING PROCESS

A new continuous bleaching process for textiles, employing peroxide as the basic reagent, was announced by The R. & H. Chemicals Department of E. I. du Pont de Nemours & Company recently.

The process has been successfully applied to cotton piece goods lighter than sheeting. Market whites, dye-bottoms and colored yarn materials are handled with equal versatility. On a wide range of fabrics, the results are characteristic of the highest qualities of uniform and permanent whiteness, absorbency, mote removal, cuprammonium viscosity and retention of fabric construction.

The mechanics of the process are extremely simple. The goods are first saturated in rope form with the bleaching solution, passed continuously through a specially designed heating tube into a J-Box, where sufficent reaction time is allowed. From that point the material is pulled through the usual type of plant washer on the way to the white bins.



New continuous bleaching process in actual operation. This equipment was manufactured by the Textile Finishing Machinery Co.

Previous attempts to bleach continuously have failed largely because the conceptions of the inventors could only be projected to mill scale by constructing huge and cumbersome equipment. Moreover, close control has been difficult or impossible. The du Pont process, in contrast, lends itself to even closer control than batch methods now practiced commercially.

Early in their work, du Pont chemists erected portable semi-continuous equipment in one finishing plant after another, bleaching a variety of goods. Recently a completely continuous unit of production size has been operated with excellent results in a prominent New England mill.

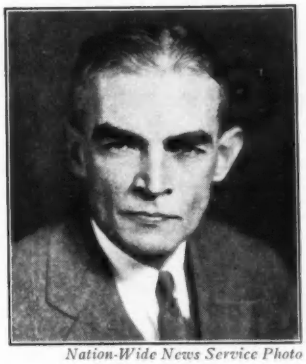
The bleaching unit consists of an upright stainless steel chamber constructed in such a manner that very efficient utilization of chemicals is obtained. Savings in steam, water and labor are claimed. The small required floor space makes it possible for a bleachery to increase its output. In fact, a production line schedule now may become a reality.

The speed with which the goods can be turned from the grey state into finished material ready for shipment is a notable feature. Processing time can be reduced by a day or two depending on the existing plant facilities, because only one to five hours are required to pass the goods from desize or sour to the white bins. Quicker deliveries can be made to the customer.

Process and equipment patent coverage has been applied for. The new equipment will be constructed by manufacturers of textile finishing machinery.

• FARGO ELECTED PRESIDENT

F. Miller Fargo, Jr., Executive Vice President of the Calco Chemical Company, Inc., Bound Brook, N. J., has been elected President of the Company succeeding Robert C. Jeffcott, who retired April 30th.



Nation-Wide News Service Photo

F. Miller Fargo, Jr.

Mr. Fargo has been connected with Calco since it was founded in 1915 by Mr. Jeffcott. The company was formed at the outbreak of the World War to supply certain dyes and dye intermediates which had previously been imported. Beginning with a plant covering 10 acres and consisting of three buildings, Calco has grown until it now covers over 110 acres with 100 buildings. The list of products it manufactures has passed the 700 mark.

In 1929 Calco became a subsidiary of the American Cyanamid Company. It is today one of the leading dye-stuff manufacturers in the United States.

• MAY ISSUE, TEXTILE RESEARCH

The May issue of *Textile Research* not only publishes the address of Fuller E. Callaway advocating a $25,000,000 annual fund for textile research, but admits that it makes the research expenditures to date of the Institute for Textile Research and of the Textile Foundation look like those of a "bunch of pikers." It emphasizes the fact, however, that of $66,000 spent by the Institute for research since 1934 less than $20,000 was contributed by the industry, and that the Foundation has spent about $500,000, none of which was contributed by manufacturers. Mr. Callaway, however, is credited with having dramatized to the industry the need and possibilities of an adequate research program.

The sixth in the series of reports of the Institute's completed research on warp sizing is delayed until the June number, because it includes data that remains confidential to the financial co-operators until then. The subject of this report is "A Photomicrographic Method for Determination of Warp Size Distribution on Viscose Rayon."

In the same issue appears the first installment of a notable article by Deane B. Judd, physicist, National Bureau of Standards, on "Specification of Uniform Color Tolerances for Textiles."

• LEIPZIG FAIR

The Spring Session of the Leipzig Trade Fair recently concluded was the best attended in its history. A total of 331,256 buyers were attracted from seventy-two countries, an increase of 27,256 over last year. The foreign visitors numbered 29,925 including those from the United States. The Fair comprised 9,894 exhibits of every conceivable art and industrial product, including 557 from thirty-two foreign countries. The exhibits showed a gain of 383 over last year and an increase of 54 per cent over 1933.

• TEXTILE STUDENTS WIN HONORS

A number of textile students were honored by North Carolina State College at the 14th annual Scholarship Day exercises on May 4, when special awards were presented to top-ranking students in various activities and the honor roll for the year was announced.

Plant of the Calco Chemical Co.

The medal awarded annually by the National Association of Cotton Manufacturers to the most proficient textile student in the graduating class was presented to Walter L. Fanning of Shelby, a senior in Textile Manufacturing. Mr. Fanning is a member of the tennis team, has served as vice-president of Student Government this year, and as a student assistant in the department of Yarn Manufacture.

William L. Carter of Franklinville won the Sigma Tau Sigma medal as the senior with the highest scholastic average in the Textile School.

The coveted Elder P. D. Gold Citizenship Medal awarded to the senior who has shown most proficiency in athletics, studies, public speaking and campus leadership, was given to Horace R. McSwain of Shelby, who is president of the College Y. M. C. A. this year. Mr. McSwain is a senior in Textile Manufacturing.

J. B. Hines of Winston-Salem, co-captain of the 1938 football team, and a senior in Weaving and Designing, received the Alumni Athletic Trophy voted by the student body to the most outstanding athlete in the senior class. The trophy was presented by John W. Sexton of Raleigh, president of the General Alumni Association.

The Karl Shurz Memorial Foundation Award for the senior doing the most outstanding work in modern languages was presented to Harold Nass of New York City, a senior in Textile Chemistry and Dyeing.

An Orchestra Key was presented to Harold Nass, New York City. Band Keys were presented to T. F. Parks of Lenoir, and R. A. Taylor of Whitakers, seniors in Textile Chemistry and Dyeing and Textile Manufacturing, respectively.

● FOUR NYLON PATENTS

Four patents for hosiery and other knitted fabrics made of nylon, the new organic textile fiber derived basically from coal, water and air, were issued to E. I. du Pont de Nemours & Company by the U. S. Patent Office on May 9th. With the issuance of the patents, officials of the company asserted the inventions represented "a phenomenal advance in the textile arts," assuring "a truly successful stocking from a synthetic yarn."

The patents set forth that nylon has great elasticity, strength and wearing qualities; that it presents an excellent appearance; that it is virtually wrinkle free; that it dries extremely rapidly after laundering; and that stockings made of it may be washed repeatedly without material change in their original shape and smooth characteristics.

The patents cover the use of polyamide yarn for stockings, pre-boarding of stockings, setting yarns and fabrics, and the use of sodium sulfite for setting.

Helen Paterson examines—and displays—hosiery made of nylon. Now on display at the New York World's Fair in du Pont's "Wonder World of Chemistry" exhibit.

"Nylon is little sensitive to water spotting," says the company announcement. "Stockings made of it are essentially crease-proof under ordinary conditions. However, creases purposely introduced by steam or hot water during manufacture are retained.

"Nylon fibers are characterized by high tensile strength, high resistance to moisture and extraordinary opposition to all ordinary solvents.

"In preparing knitted stockings in accordance with the patents, nylon yarns of varying sheen may be used. The yarns may be lustrous, semi-lustrous, or dull. Dull yarns generally are preferred.

"Nylon takes dyes used for silk, wool, cotton or rayon. Excellent effects are obtainable with acetate dyes. Experiments have demonstrated that dyes may be applied to the finished fabrics or to the yarn used for knitting. Certain pigments may be incorporated in the nylon from which the yarn is prepared. Other types of fibers and yarns, such as silk, viscose rayon, and cellulose acetate rayon may be used if desired in combination with nylon fibers and yarns.

"A characteristic of nylon hosiery is its rapid drying after laundering. Nylon absorbs comparatively little moisture. It has virtually the same strength when wet as when dry.

"Nylon fabrics are, however, affected in a remarkable way by steam or hot water setting, improving them in various ways. For instance, steam treatment enhances the elastic recovery, crimp and crease retention. So pronounced are these effects that nylon stockings are as smooth and free from wrinkles after laundering as when new.

"Although nylon in the form of filaments, fibers, bristles, films, and fabrics can be set with steam or hot water, the ordinary treatment requires appreciable time. However, the treatment can be greatly accelerated by small quantities of a water-soluble sulfite. Thus, in a specific example, approximately 20 minutes' treatment with steam was required to produce high crimp retention, whereas crimped filaments taken from the same original sample, but which were first moistened with a sodium sulfite solution, gave a product of equally good crimp retention in 10 seconds' treatment with steam under comparable conditions.

"Once a nylon fabric has become set, a condition of heat and moisture more severe than the condition of set is necessary in order to effect a resetting in another shape. Therefore, nylon stockings are given a preliminary set known as "pre-boarding" in the desired shape immediately after knitting. The stockings are then immune to any wrinkle set during scouring, dyeing, and rinsing. This pre-boarding process is covered in the patents.

"Since pre-boarding is the first hot, wet treatment in the sequence of manufacture, it determines in large degree the permanent shape and smoothness of the stocking.

"Stockings made in accordance with the patents present an excellent appearance. Because the effects of setting are practically permanent, the stockings may be laundered and dried repeatedly without material change in their original shape and smooth appearance. Thus, a characteristic of nylon that once threatened serious difficulty in the finishing process, has been turned to advantage.

"According to the patents, nylon can be spun by extruding it when molten and cold drawing the resulting filaments. Cold drawing—stretching in the solid state—causes the molecular orientation along the axis of the fiber, just as links are aligned in a long chain. This produces the qualities most desired in fibers, namely, great strength and pliability. Fibers prepared in this way are continuous, straight, soft, smooth, and lustrous."

The company's chemists say nylon is the first man-made organic textile fiber prepared wholly from raw materials from the mineral kingdom. Other textile fibers in general use, including cotton, silk, wool, rayon, and linen, are derived from animal or vegetable materials.

Nylon differs from rayon, another man-made fiber, in that it contains no cellulose.

The word "nylon" was coined by the du Pont Company as the generic name for all materials defined scientifically as "synthetic fiber-forming polymeric amides having a protein chemical structure; derivable from coal, air, and water, or other substances, and characterized by extreme toughness and strength and the peculiar property to be formed into fibers and into various shapes, such as bristles and sheets."

Nylon, a new and the most important recent discovery coming from chemical research, is so versatile that the extent of its varied commercial uses can only be guessed today. Experimentally, it has demonstrated greater strength and elasticity than any fiber now in general use, whether cotton, wool, linen, rayon or silk. Moreover, the filaments can be drawn as fine as a spider's web.

Announced only a few months ago, nylon is being marketed commercially at present only in the limited quantity permitted by a small pilot plant located at the company's experimental station near Wilmington, Del. It is being employed as tooth brush bristles, sold under the trade name of "Exton"; for sewing thread, fishing lines and fishing leaders.

However, experimentally it is lending itself most satisfactorily not merely to the making of fine hosiery and other knit goods, such as underwear, but to an increasing number of other textile products, and products differing very widely from textiles.

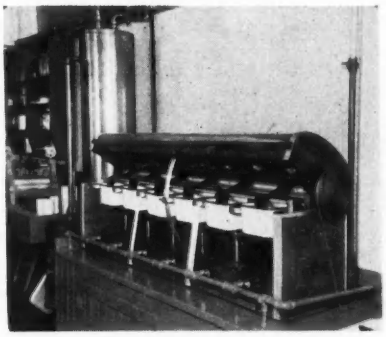
To bring nylon into general commercial production as early as possible, the company is spending $2,500,000 on plant extensions at Belle, W. Va., for making nylon intermediates, and $8,500,000 on the erection of a nylon textile plant at Seaford, Del. Both projects are scheduled for completion early in 1940. More than 650 workers are being employed at present in constructing the Seaford plant and 500 on the Belle additions. The new facilities at Belle will be used to manufacture the materials needed by the Seaford plant, which, initially, will require approximately 1,000 employes.

• NEW PHENOL PLANT

Announcement has been made by The Barrett Company, a subsidiary of Allied Chemical & Dye Corporation, that it will immediately construct a new unit at its Frankford, Pa., plant for production of synthetic phenol. The new plant will provide facilities to supply the increasing requirements of the rapidly expanding domestic plastics industry.

• LABORATORY DYEING MACHINE

The William J. Score Company, 165 Salem St., Reading, Mass., is now ready to furnish to the textile industry laboratory dyeing machines. These machines are said to eliminate much of the guesswork hitherto unavoidable in checking with mill results. Among some of the users are the W. C. Durfee Company of Boston, Mass., and the Lowell Textile Institute, Lowell, Mass.



Laboratory Dyeing Machine

Two types of machines are available; one, a six kettle machine handling pieces of 50 to 100 gm. weight or skeins of equal weight; the other, an eight kettle machine for use with samples weighing 10 to 50 gms.

Full information is available from the company.

• WEAR TEST SURVEY

The United States Testing Company reported last October on the type of tests and minimum specifications set-up for the control of the Certification of Tubize Rayon Knit Underwear and Tubize Fabrics of Chardonize Rayon Yarn. The laboratory specifications required a bursting strength of at least 50 pounds dry and 25 pounds wet with specific requirements for shrinkage, color fastness, measurements and workmanship.

At the time of publishing the minimum requirements for Tubize Certified Quality Garments, the Testing Company undertook an elaborate consumer practical wear test survey to correlate actual wear results with laboratory test specifications. Hundreds of Tubize Certified Quality Garments were distributed to consumers throughout the country. Individuals participating in the practical wear test included Home Economists, Extension workers, retail store training directors, housewives, students, instructors and laboratory workers. All sizes and types of garments were used in this study to obtain a true cross section analysis of the wear and service obtained from garments previously tested and approved based on laboratory test standards.

Tabulation of results is now nearing completion so that final report will be available in the near future. The Testing Company stresses the importance of collaborating laboratory tests with practical wear tests in the certification of merchandise for consumers and points out that this survey on Tubize Garments, probably one of the most extensive ever undertaken, will help to firmly establish consumer confidence in the certification and labelling of merchandise.

• ATTENDING CONFERENCE

Dr. Harold DeWitt Smith of the A. M. Tenney Associates sailed on May 24th on the Queen Mary for a brief visit in England, where he has gone especially to attend the Annual Conference of The Textile Institute the subject of which is, "Production, Properties, and Utilization of New Fibers." In conjunction with this meeting, there will be an exhibit of new, man-made fibers, both American and European, and of fabrics made from them. Dr. Smith is contributing a paper on Teca, the crimped staple fiber made by the Tennessee Eastman Corporation and samples of Teca fiber, yarns, and fabrics have been sent to be included in the exhibit.

• du PONT RELEASES

A new finishing agent and two new dyestuffs have been announced by E. I. du Pont de Nemours & Company.

Avitex VS—a special type of fatty alcohol sulfate finishing agent which is designed to give a finish with a very smooth surface and a fairly full hand, particularly on many types of spun rayon materials and continuous filament rayon fabrics such as flat crepes, twills, serges and taffetas. It is said to impart an appearance and feel of quality to cloth and to improve the brightness of whites on prints. The closeness of the face of the cloth is said to be increased and the oiliness decreased, producing a greater resistance to soiling. It shows extreme resistance to the calcium and magnesium salts found in hard water, it is claimed, and is stable in both acid and alkaline solutions.

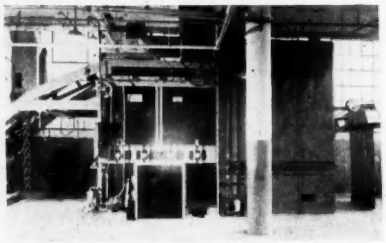
Ponsol Gray R L Paste—a new vat color producing neutral to reddish shades of grey, depending on the strength of the dyeing. It shows the good all around fastness of the vat color group and is particularly resistant to washing, light, perspiration, hot pressing and cross-dyeing, the company says. The reduced vat of this color is very stable. It is said to show very little shade change in the caustic soda treatment with "Sitol" and less staining of cotton when dyed on unbleached cotton than on bleached. The color is well suited to Franklin machine package dyeing and pigment-pad work. It is particularly recommended by the manufacturers for shirting shades as it is very resistant to chlorine and power laundering with chlorine.

Acetamine Diazo Black B G D—a new acetate fiber color, is recommended by the manufacturers for application in the jig and produces full, well penetrated shades of black, particularly on acetate rayon satins and taffetas. The color shows excellent fastness to sublimation and crocking and satisfactory fastness to all other destructive influences commonly encountered, it is claimed.

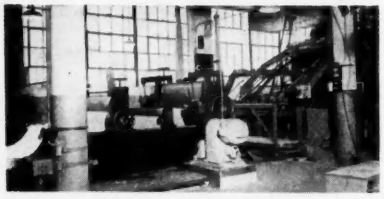
• NEW CARBONIZING RANGE

A new "Flat line" carbonizing range was recently installed in a well-known New England mill by Riggs and Lombard, Inc. of Lowell, Mass. It is said to be characterized by increased production in a relatively small space, uniform quality of product and reduced cost of upkeep, which results are made possible by the following features:

A solid metal tank with a one-piece vulcanized rubber lining, which means a lifetime job and absence of the leakage and repairs which occur in wooden tanks. This tank also has extra large capacity and requires bringing up to strength only twice a day on ordinary work.



Showing tenter dryer and baker from left to right.



Showing rubber-lined acid soaking tank and extra heavy squeeze rolls.

Three sets of squeeze rolls which make for greater acid penetration, the last set of rolls being extra heavy for extraction and having no vacuum slot. All immersion rolls are rubber covered.

A circulating system (not shown in photo), consisting of an outside, elevated, rubber lined tank into which all acid additions are made. A motor driven lead pump, with rubber hose, draws the liquor from the main tank, discharges it into the auxiliary tank, and returns it by gravity to the main tank.

The flow of acid through the main tank is counter-current and the pump capacity is sufficient to completely change the liquor every few minutes. This active circulation is an important feature contributing to increased production and uniformity of product.

• BROWN CATALOG

The Brown Instrument Company has just published a new catalog, "Instruments for the Textile Industry." Featured in this new catalog is the new Brown Moist-O-Graph Recording Controller which measures, records and controls moisture content of cotton warps and fabrics. Regain in warps is automatically maintained within plus or minus one-half per cent by means of slasher speed control. This catalog also includes the Brown Size Box Temperature and Level Control Systems; and Size Cooking and Storage Kettle Controls. Various Brown Temperature Controllers for Bleaching, Mercerizing, Dyeing and Drying are illustrated and described as well as the complete line of Brown Humidity Controllers. Address The Brown Instrument Company, Wayne and Roberts Avenues, Philadelphia, Pa. and ask for Catalog No. 9304.

• RESEARCH ASSOCIATE

The Special Committee for Testing of Textile Finishes announces the appointment of Edwin C. Dreby as research associate. The Special Committee for Testing of Textile Finishes is sponsored by Committee D-13 on Textile Materials of the American Society for Testing Materials. The present subscribers to its research program are:—

American Viscose Corporation, Cranston Print Works Co., E. I. du Pont de Nemours & Company, Geigy Company, Inc., Hart Products Corporation, Hercules Powder Company, National Oil Products Company, Sandoz Chemical Works, Inc., Scholler Brothers and Sears, Roebuck & Company.

The research program of the Committee, which will be carried out at the National Bureau of Standards, will emphasize methods for the physical evaluation of the "handle" of textiles, and will include test methods for certain other types of finishes.

CLASSIFIED

POSITION WANTED: Dyestuff Salesman and Demonstrator, now employed, desires to make change. New England territory preferred. Salary secondary, will consider South. Write Box No. 181, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED: Dyer with practical experience in dyeing of silk, viscose rayon, and acetate rayon; also mixed fibers. Capable to take charge or supervise all operations of dyeing; also practical experience in weighting of piece goods and skein. Expert in dyeing of chrome and Indigosol colors. Laboratory practice. Best references from leading concerns. Willing to take position as Boss-Dyer, Supervisor or Demonstrator in any part of the world. Write Box No. 185, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

FOR SALE: Printing Machine, Rice, Barton and Fales, six color, 36″ drum, 33″ wide, 32″ rubber blanket, back grey rewind, variable AC drive, eight copper rollers. Box 352, Fair Lawn, N. J.

REPRESENTATIVE WANTED: A man with personality, textile mill contacts, ambition and ability. To cover northeastern cotton and woolen mills for a live organization where results will get their deserved reward. Write details of yourself, training and experience in first letter. Write Box No. 187, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

OPPORTUNITY FOR SALES REPRESENTATION: The Textile Industry has enthusiastically welcomed the new Cation-Active permanent finishing agents. They appreciate the broad application of these radically different products, based as they are, upon a new principle of chemistry.

An organization located in the metropolitan area has for over twelve months marketed a Cation-Active permanent finish which has met with an unusual amount of trade acceptance.

This Company plans to market its product in the future through recognized sales organizations who enjoy an intimate contact with the textile industry.

An unusual opportunity is offered to those organizations who will be selected as direct representatives.

Communications will be held in strict confidence.

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